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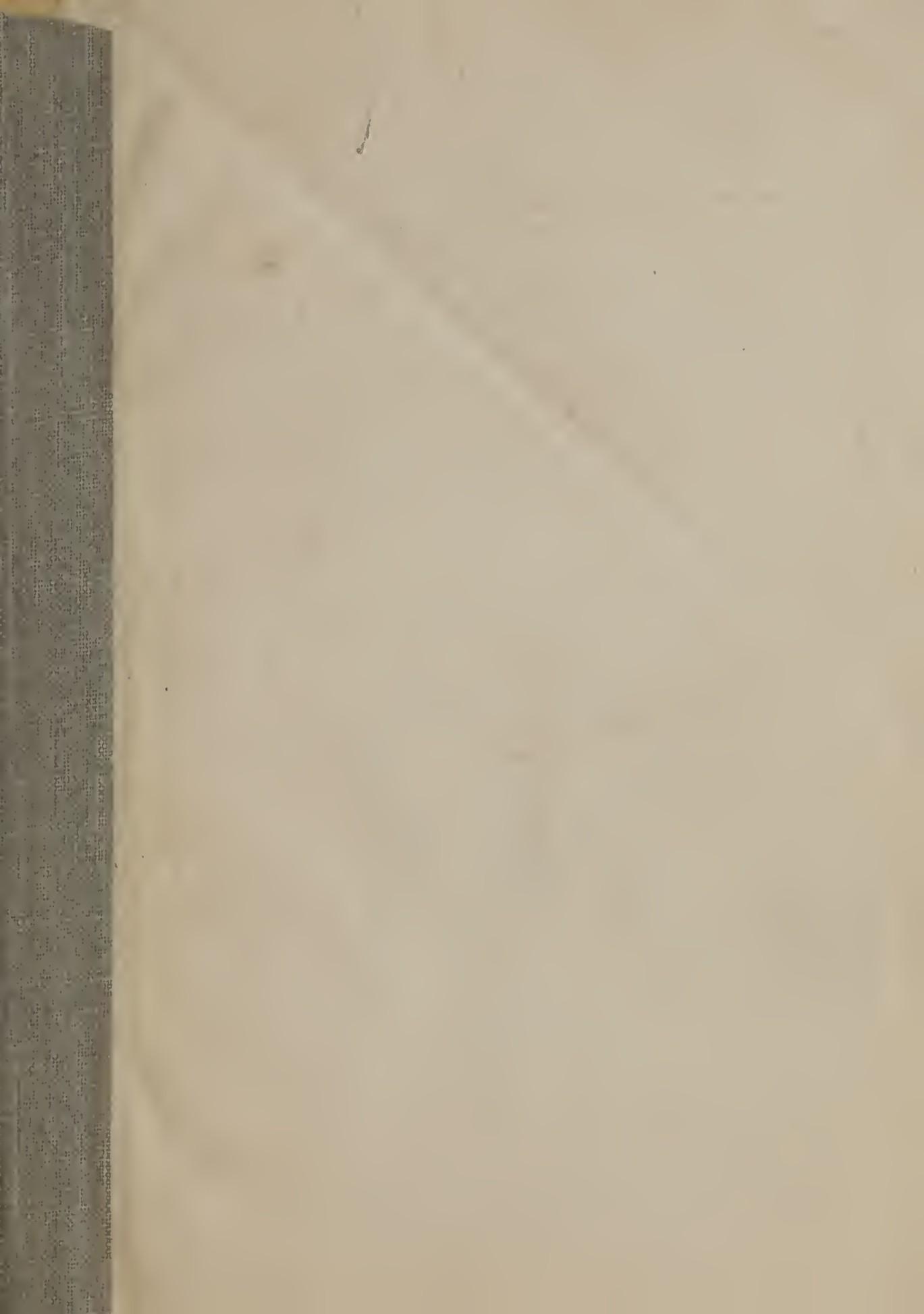
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Issued September 18, 1915.

U. S. DEPARTMENT OF AGRICULTURE,

FOREST SERVICE.

HENRY S. GRAVES, FORESTER.

**FIRE PROTECTION
IN
DISTRICT 1.**

FOR THE USE OF FOREST OFFICERS.

(F. A. SILCOX, District Forester.)



"MINUTES COUNT."

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1915.

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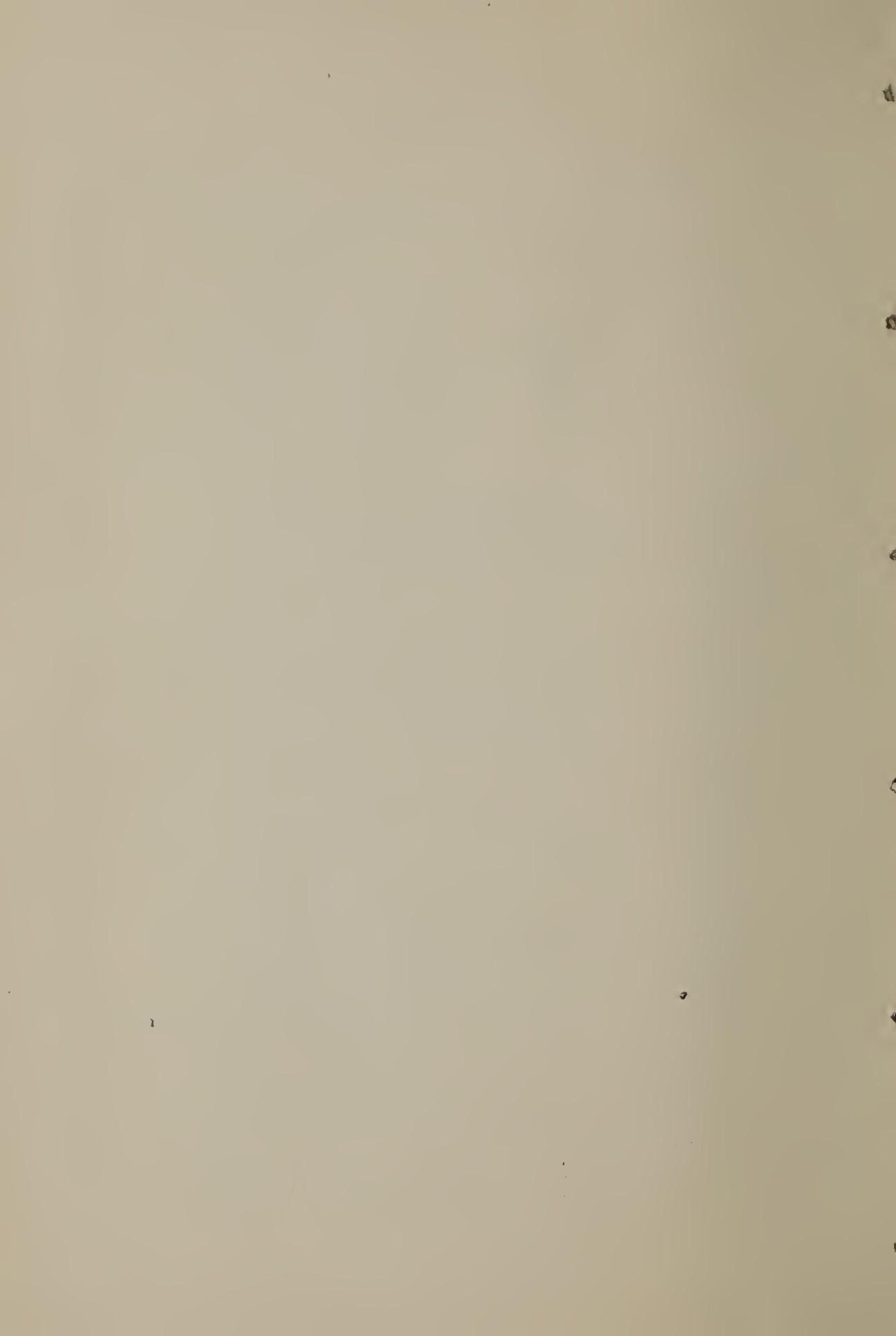
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FIRE PROTECTION IN DISTRICT 1.

GENERAL.

Purpose.

This handbook is planned for field use in District 1, covering briefly all phases of the problem of fire protection on the National Forests. The problem logically divides into three parts: Prevention, detection, and control. In addition, chapters are included on organization and finances.

Terminology.

Definitions of the terms used in this handbook are given in the appendix. Reference to the list will greatly assist in understanding the text. Knowledge of the exact meaning of words and expressions is particularly essential in a discussion of fire protection.

Importance.

Fire protection is of first importance in National Forest management. No other work must be allowed to crowd it out. Even the construction of permanent improvements, which is so closely related to the fire problem, must take second place. The following is the policy as outlined at the supervisor's meeting in February, 1914, and now in effect:

(1) The fire plan for each Forest will be put into effect for a continuous period of approximately two months each season, usually during July and August, as well as during other periods of danger. During this period no other work will be allowed to break down the integrity of the fire protective organization.

(2) Each Forest will, where practicable, complete the work of repairs of trails and telephone lines, either with the regular patrol force or with such additional assistance as may be necessary, prior

to July 1 of each year. Additional necessary maintenance work during July and August will be carried by the patrol force only in so far as this may be done without breaking down the integrity of the fire protective organization.

(3) For two months each season every Forest will, when not actually fighting fire, conduct a study of the fire protective problem with especial reference to testing the efficiency of the organization and determining in what way it may be improved. This may be done by surprise or test fires or any other means which will furnish accurate data.

Normal fire season—Emergency fire season.

Climatic conditions govern the degree of severity of fire conditions. Subnormal, normal, and abnormal are terms readily understood, but the exact lines of demarcation have not been fixed. The money regularly allotted to provide for the patrol force on each Forest is based on the fire conditions resulting from a normal season. For an abnormal or emergency fire season this force must be increased. Whenever conditions arise which can not be handled effectively by the regular patrol force (efficiently managed) an emergency period exists. Such conditions if continued for several weeks, constitute an emergency fire season.

Weather data.

To predict the coming of an emergency period or to recognize it even before the number or intensity of fires tells the story, is obviously essential. The expenditure of comparatively small sums in strengthening detection, or first line of defense, if made in time, means the difference between success or failure in the fire game.

What is the criterion or index by which an emergency period may be recognized? The factors are rainfall, temperature, cloudiness, wind, humidity, etc. It is difficult, with so many factors involved, to arrive at any simple plan of expressing conditions. The data from the National Forests has been incomplete, and until accurate records are available predictions will be difficult. Weather records will, however, prove more and more valuable as an aid to the solu-

tion of the fire problem; they must be carefully studied for each Forest. The simplest indication of fire conditions is the length of time without rain, disregarding light showers not exceeding one-tenth of an inch. Such a record is chiefly valuable as an analysis and comparison of past fire seasons.

Wind velocity.

The old weather bureau scale of wind force will be found useful as a simple means of expressing wind velocity:

Name.	Miles per hour.	Apparent effect.
Light.....	5 to 15	Moves leaves of trees and small branches; blows up dust.
Moderate.....	15 to 25	Good sailing breeze; moves leaves and other light objects along ground.
Brisk.....	25 to 35	Sways trees and breaks small branches.
High.....	35 to 50	Damages small frail buildings, grain or hay in field.
Gale.....	50 to 80	Prostrates exposed trees or frail houses.

Forest-fire plan.

A forest-fire plan consists of two principal parts:

(1) The basic data derived from a study of such factors as risk, value of resources, weather, inflammability, accessibility, lookouts, and all other conditions affecting the fire problem.

(2) A program or plan of work based upon the foregoing data.

The data for the first part of the fire plan will gradually accumulate as our knowledge and experience increases. The second part will be revised annually in accordance with changes in knowledge, experience, and finances. The program or plan of work will be based on conditions existing in a normal fire season and will also outline the program to be followed for an emergency season. This program will be made in detail for each ranger district and in less detail for the Forest as a unit. To be effective, a fire plan must be developed largely by the district ranger, who is responsible for its execution.

Fire survey.

One way to secure part of the data for Part One of the fire plan is to organize a crew which will make a survey or reconnaissance of the Forest. Information would be obtained through test fires, actual observation, triangulation, and other means to determine:

- (1) Efficiency of present patrol system.
- (2) The liability or value, location, and area of different timber types, grass, and barren land.
- (3) The risk.
- (4) Controllability.

Such a survey would show—

- (a) The unseen areas, that is, the areas not seen at any time by any of the patrolmen, and
- (b) The seen areas, classified somewhat as follows: Areas seen constantly; areas seen twice in 24 hours; areas seen once in 24 hours; areas seen once in 48 hours; areas seen twice per week.

The study of the risk includes an interpretation of past fires, both the paper records and those recorded only in the Forest itself. The exact scope of the work of a fire-survey crew has not been completely determined. This work is urgently needed; it can be done by one man by a slow and gradual process, or by a crew of from 2 to 6 men. It means simply an analytical field study of all the factors affecting the fire problem.

Protection standard.

Standards for fire protective work are desirable for several reasons:

- (1) To determine the maximum amount of money which the Government is justified in spending for the protection of any Forest.
- (2) To measure the efficiency of the protective organization and to compare with other Forests and other years.
- (3) To compare the relative value of expenditures for different items of protection, such as signs and posters, primary patrol, secondary patrol, smoke chasers, etc.
- (4) To make clear to the public the degree of fire protection the Forest Service is giving for the money appropriated by Congress.

A simple standard is very difficult to determine, and no single standard is satisfactory. The following treble standard has been tentatively adopted:

For any year:

(a) The maximum area burned on any Forest must not exceed 0.001 of its total area.

(b) Ninety-five per cent of all fires in the "fixed risk zone" and 85 per cent of all fires in the "blanket-risk zone" must be held within the classification for A and B fires.

(c) The average area for class C fires must not exceed 100 acres.

The first standard is a general one on a broad area basis; the second is an approximate measure of the efficiency of primary and secondary patrol, and the first line of defense; the third measures roughly the efficiency of the second and third lines of defense. These standards are established arbitrarily after an examination of past records, and will undoubtedly require revision after a thorough trial.

Fire cooperation.

The Forest Service is authorized to cooperate with private owners in fire protection only where the protection of the proposed cooperative areas is necessary to the more efficient or economical protection of the National Forests. Divided responsibility must be carefully avoided by (a) having the Forest Service assume entire direction of the protective forces, and sharing the cost among the respective owners on an acreage or valuation and risk basis, or (b) dividing the cooperative area and delegating entire responsibility for one portion to the Forest Service and for the remaining portion to the cooperators organized into an association or in some other manner. In the latter method the total cost can be shared as previously indicated, or each party may pay the cost of patrol and share the cost of fire fighting on a pro rata basis, or each party may pay the entire cost of protection for its allotted area. The last method is much the best, since there exists no possibility of misunderstandings, and long

delays in final settlement of accounts are avoided. There are two methods of pro rating the expenses on an acreage basis:

(1) According to the percentage of Government and private holdings within the cooperative district, or

(2) According to the same percentages for the burned area or for an area threatened by each fire.

The first method is the more satisfactory.

All cooperative arrangements must be written, usually in the form of agreements, and must be approved by the district forester. All conditions must be clearly and definitely stated in the agreement, and supported by maps and memoranda. Sample agreements will be furnished by the district forester upon request. To make any plan of cooperation work requires constant attention and active interest by the responsible forest officer. The arrangements must be mutually beneficial and the actions of both parties such as to inspire confidence. Respect, personal contact, and mutual help play important parts.

ORGANIZATION.

Scope of chapter.

The subject of organization is given a distinctive place in order to emphasize its importance, and to outline the broad features unconfused by details. The same subject will necessarily be discussed in succeeding chapters supplementing the general plan shown here.

Skeleton force.

The skeleton yearlong force for fire protection will be considered as composed of the men occupying the positions of district forester, assistant district forester, forest supervisor, deputy forest supervisor, and district ranger. The rank and authority of each is in the order given. All other positions are considered administrative, and the men occupying them have no authority in directing the work of fire protection unless authorized to do so by one of the proper officers.

Duty of skeleton force.

It is the duty of the skeleton force to train a temporary patrol force of 500 or 600 men, and make of the whole an efficient fire-fighting machine. This is possible for a normal season. For an emergency season there is added to the skeleton or directing force every other regular member of the Forest Service. The regular patrol force is increased, and fire fighting on a large scale is carried on by means of temporary laborers.

The problem.

The problem is to build up a sufficiently active, efficient, and well-trained skeleton force to make possible the large expansion necessary during every fire season. The most important positions in the yearlong fire organization are district forester, supervisor, and district ranger; in numbers they bear about the proportions of 1-25-200. The expansion is necessarily large for a normal fire season. Considering the general character of men employed as patrolmen and the comparatively short period of their work, it is sufficient to ask of the regular yearlong force to redeem the responsibility for only normal fire seasons. But the organization must be so built and the responsibilities so routed that the directing force itself can be greatly increased without causing friction, lost motion, or embarrassment.

District forester.

The district forester will make all necessary arrangements for giving the Forests the assistance they need during an emergency period or season. Each assistant district forester will be assigned to a group of Forests. It will be his duty to keep in close touch with the weather and fire conditions and to make sure that each Forest is taking the necessary action to control the fires. He will work out cooperative arrangements with the associations and other protective agencies. Only in rare instances will he go into the field to actually take charge of individual fires.

District ranger.

The heaviest burden of fire protection falls on the district ranger. He is responsible, on a certain allotted area, for all lines of protective work—prevention, detection, and control—and usually more or less current administrative work in addition. His principal job is detection and control—detection always, and control only to a point where he is able to efficiently handle it. This means usually fires of classes A and B, and the smaller class C fires.

Fire-fighting forces.

Fire-fighting forces may be classified as first, second, and third lines of defense.

First line: Primarily smoke chasers, but includes all the regular protective force.

Second line: Forest officers not a part of the regular protective organization, improvement, reconnaissance, and other crews, forest users, settlers, and per diem guards.

Third line: Fire fighters drawn from the general labor markets.

Project fires.

The district ranger's primary function is to handle detection and control up to the third line of defense. He will handle the third line of defense as long as the machinery at his disposal is adequate to maintain the desired efficiency. At just what point such machinery becomes inadequate is a matter about which the ranger must use judgment, taking into account his specific instructions from the supervisor. Ordinarily the larger fires will be put on a project basis; this usually means those fires requiring outside help which can not be extinguished within two or three days' time.

Fire chief.

Project fires will be placed in charge of a fire chief, who may be a man detailed from the patrol force, a local man engaged for the purpose, a forest officer detailed by the supervisor, or the district ranger himself. In the latter event the position of district ranger becomes vacant, and some other man must be assigned to this work.

It is apparent that the same man can not fill the position of district ranger and fire chief on a project fire at the same time. It will be the duty of the district ranger, however, to do the best he can in both positions, if necessary, until the supervisor can send him relief. If the supervisor can not fill the gap, the district forester will send assistance, either by transfer from the forces under his control or by appealing to the forester for aid.

Quartermaster.

On most large fires it is advisable to assign a quartermaster to attend to the duties of getting supplies and men as requested by the fire chief. In a great many instances the district ranger or the fire chief or the clerk in the supervisor's office can fulfill this function without serious interference with established duties. Whenever necessary to secure the required efficiency, a special man will be secured in the same manner as a fire chief is obtained.

Relation of district ranger, fire chief, and quartermaster.

Unless otherwise declared by the supervisor (or higher authority), both the fire chief and the quartermaster will work directly under the district ranger and be governed by his instructions. The two positions will be coordinate, and neither man will have any authority over the other. The fire chief will handle one fire or portion of a fire, and the quartermaster will look after the needs of all the fires logically supplied from one base. Naturally, wherever greater efficiency can be secured, one or both these officers will report directly to the supervisor.

Selection of patrol force.

The district ranger is responsible for the efficiency of the work in his district, and the supervisor for the entire work on the Forest. The fundamental factor in securing efficiency is the selection of the personnel. Obviously, therefore, the district ranger should, so far as practicable, have a hand in selecting the patrolmen who are needed for his district. He will make his recommendations to the supervisor, who will pass upon them. The district forester, upon

request, will aid in the selection of forestry students or men for any particular position for which local material is not available. The opportunity to train men for future rangers offered by the position of patrolman should not be overlooked.

Instructions.

Before the beginning of the fire season the supervisor will give the district ranger written instructions, outlining his duties and authority, and indicating the qualitative and quantitative standards by which the results of his work will be measured. Usually the instructions covering fire protective work will be incorporated with similar outlines for other duties.

The district ranger, on his part, should give every patrolman similar written instructions, which will be approved in advance by the supervisor.

Training.

The fire game is one in which every player, if the team expects to win, must do his full share. When three-quarters of the players are more or less new at the game the importance of training is apparent. Never take for granted that a patrolman knows what is expected of him. Tell him the rules of the game, the whole plan of the organization, the standards which govern, his exact function in promoting the general scheme, and just exactly what he is to do when his turn comes.

This training must be carried mostly by the district ranger and continued throughout the season—by talking, by drawing pictures, by object lessons, by questions, by supplying literature or any other possible means. The Forest Service forms and procedure, in so far as they apply, must be explained; but above all, every patrolman should be made to feel that he is a part of a great organization with very definite ideals and practical purposes. The esprit de corps must be felt by a patrolman if his whole-souled cooperation is to be obtained. Plan definitely for periodic visits throughout the season to every patrolman and adhere to the plan so far as conditions permit. Usually the district ranger should spend from one day every

week to one day every two weeks with each man, depending upon the latter's experience and ability.

Discipline.

The fire plans once made, the positions filled, the instructions given, every man must adhere absolutely to the rules. If he is not willing to do that he only clogs the machinery and must be removed. Unless superseded by instructions from the supervisor or higher authority, the district ranger is the boss within his district and every man must be governed accordingly.

In a similar way the fire chief is absolute boss of his fire, and unless superseded under instructions from the district ranger or higher authority, he must be obeyed without question.

Inspection.

A fire protective organization is not automatic. The men employed either in yearlong positions or as patrolmen differ in degree of efficiency and alertness. There is nothing which will take the place of systematic inspection as a means of keeping a big organization actively alert. Inspection which is constructive—by the district ranger, the supervisor, and representatives of the district forester—is needed. On some Forests where current business is very heavy, a special man has been assigned as fire inspector. The bulk of the inspection work, however, must be carried on from the supervisor's office. Surprise fires have proven their value in inspection work wherever they can be used with safety.

Fires outside ranger district.

The district ranger is primarily responsible for the fires which occur within his allotted territory or ranger district, and for maintaining the integrity and efficiency of his organization. Usually a fire discovered in an adjoining district requires simply a report to the proper forest officer in order to insure action. Cooperation between district rangers, however, must be complete, and should extend even to the point of a ranger fighting fire outside of his own district, when that can be done without actually endangering the area for which

he is responsible, and the adjoining district needs assistance. Without specific authority from the supervisor, however, any action taken by a ranger to extinguish fires outside of his own district should be of short duration. The matter is one which must be left largely to the judgment of the district ranger, guided by the principle that his chief job is to run the protective machine within his own territory, but bearing always in mind that he belongs to a wide-spread organization designed to stop forest fires wherever they occur.

PREVENTION.

Causes of fire.

Most fires are caused by human carelessness or maliciousness; the records show that about 70 per cent of all fires in the National Forests of Montana and northern Idaho originate in this way. Fortunately only a small per cent are intentionally started.

Railroads.

Danger from railroads can be lessened or eliminated entirely only through action by the district forester, the State, or some associated effort. Action to secure right-of-way clearing and other preventive measures by the railroads will be initiated by the district forester. Forest officers can assist by establishing friendly relations with the local officials of the railroads and keeping an accurate record which will show the responsibility of the railroads for fires along their rights-of-way.

Campers.

Campers cause fires through carelessness and ignorance. The fact that they go camping at all is sufficient evidence of their interest in preserving the natural beauty of the Forest. They do not realize the destructive possibilities of a small fire, and they do not understand how to put out a camp fire. Tact, patience, and intelligent sympathetic instruction will do a great deal to minimize this danger. Visit the campers frequently and endeavor to establish cordial relations, losing no opportunity to actually demonstrate what is meant by "care with fire" and "putting out a camp fire."

Camp grounds.

Post desirable camp grounds, clean up the combustible material, dig pits for the camp fire and for refuse, and in general encourage camping at safe places.

Brush burning.

The development of ranch property requires the burning of brush and slash. Each district ranger should assist in this work with advice as to the best time to burn and how to burn safely and economically. The ranger should take the initiative and attempt to accomplish all burning in cooperation with the settlers before the beginning of the dry period. In Idaho this can be handled by permits under the State law, but in Montana no such law exists.

Incendiarism.

There are three ways to prevent incendiary fires:

- (1) Creation of strong public sentiment against incendiarism.
- (2) Removing the incentive which may prompt particular individuals to start fires.
- (3) By making arrests and securing as many convictions as possible.

The last two methods are the most definite means at the disposal of forest officers. The incentive is often supposed to be personal gain, either profit on merchandise sold or an opportunity to work. Forest officers should endeavor to see that those suspected of incendiarism are not given an opportunity to profit because of the fire.

It is a cowardly act to start a forest fire which may destroy both life and property; the fear of the law is therefore a weapon of which full advantage should be taken.

Investigations.

Wherever a definite clue exists, or wherever circumstantial evidence appears promising, the forest officer should report the facts to the supervisor, who may, with the consent of the district forester, employ a man to follow up the evidence and try to secure an arrest and conviction.

Signs and posters.

There are two classes of signs and posters which might be used: One is the perfectly formal, conventional, general form, typified by the present standard metal signs supplied by the property clerk; the other is the informal, specific, advertising type, of which the signs supplied by the Western Forestry and Conservation Association are the best examples. It will be the policy, at least for the present, to furnish mostly the conventional United States Department of Agriculture signs. Signs designed by the Western Forestry and Conservation Association will be used to some extent, but all purchases of this character will be made by the district forester.

News items.

One of the most valuable preventive methods is a systematic effort to secure the sympathetic cooperation of the local communities by news items of various kinds. Such items should be prepared preferably in series, each series designed to accomplish a definite purpose. The public should be acquainted with all phases of forest activity, and particular emphasis placed upon the economic aspects of the National Forests as applied specifically to local industry.

Personal appeal.

Many people will assist in fire protection because it helps some forest officer. They are personally acquainted with "Bill Jones," the ranger or supervisor, and the personal element adds enough to an abstract interest in forestry to swing the scale from actual indifference or unstable equilibrium to active cooperation. Personal letters, at the beginning of the fire season, to those having occasion to go into the Forest are undoubtedly one of the best preventive measures. Wherever assistance is rendered, the forest officer should personally or by letter express the appreciation of the Forest Service. So far as practicable, information concerning final action on every fire reported should be given to the persons who sent the reports.

PROSECUTION FOR VIOLATION OF FIRE LAWS.¹**Federal fire laws.**

The Federal fire laws provide penalties for the following offenses:

(1) For willfully setting a fire or causing others to set fire to timber, brush, or grass land upon the public domain.

(2) For leaving any fire, set for any cause, unattended on public land near inflammable material.

(3) For not totally extinguishing a fire on public land before leaving it.

NOTE.—Responsibility for starting a fire must be fixed upon the same person who is accused of leaving or failing to totally extinguish it.

Interpretation of Federal law.

The offenses of setting fire to timber, etc., on the public domain, may be accomplished even if the fire is started on adjoining private land. Judge Wellborn, in his charge to the jury in the case of *United States v. Henry Clay*, stated as follows:

You are further charged that it is immaterial whether the fire of October 19, 1909, mentioned in this indictment, originated on private land if it was set willfully, and if, in the course of nature, and in view of all the surroundings, the said fire would reasonably be expected to be communicated to the public domain. A man has no lawful right to set fire to his own property, if he has reason to believe or intends that such fire will be communicated to the property of others and destroy it.

With respect to the meaning of the word "willful" in section 52 above quoted, Judge Whitson's instructions to the jury in the case of *United States v. Fisher*, fire trespass on the Colville National Forest, were as follows:

And, as to the third count, whether he willfully set on fire or caused to be set on fire the timber, slashings, or grass there growing. It is charged on the third count, that the act was maliciously done; but it is not necessary, under the statute,

¹ Text of fire laws and sample forms used in making arrests are shown in the Appendix.

that malice be shown. It is necessary to show that the act must have been willful; that is, intentional. Not with intent, however, to burn the public domain and destroy property, but purposely built the fire or purposely left it unattended or purposely failed to extinguish it. The purpose does not apply to the result, but to the acts charged for one willfully, knowingly doing an act is presumed to intend the consequences which naturally may be expected to flow from such an act.

Idaho fire laws.

Idaho fire laws provide penalties for the following offenses:

- (1) Failure to pile and burn or otherwise dispose of as directed by the fire warden, the brush and débris resulting from logging operations.
- (2) Failure to maintain on any spark-emitting engine located in a timber district a good and efficient spark arrester.
- (3) Setting fire to slashings, brush, etc., from June 1 to October 1 (closed season) without first securing a permit.
- (4) For setting a fire, with or without a permit, at any time when the wind is blowing to an extent to cause serious danger of the fire getting beyond control, or without sufficient help present to control it, or failure to watch the fire until it is out.
- (5) Failure of a railroad to keep its right of way (50 feet on each side of center of track) clear of inflammable refuse during the closed season.
- (6) Leaving a deposit of fire, live coals, or ashes along railroad tracks in the immediate vicinity of woodland.
- (7) Failure of an engineer, conductor, trainman, or section man to report promptly at the nearest telephone or telegraph station any fire discovered by him adjacent to the railroad track.
- (8) Failure of a railroad company to furnish available help in extinguishing a fire which occurs near the line of the road.
- (9) Kindling a fire on or near a forest or prairie land and leaving it unextinguished.
- (10) Using combustible wads for firearms in or near forest land.
- (11) Carrying a naked torch, firebrand, or exposed light in or near forest land.

(12) Failure to totally extinguish a camp fire.

(13) Destroying, defacing, etc., any fire sign posted under authority of the State.

(14) Willfully or maliciously setting on fire or causing to be set on fire any timber, underbrush, or grass on the public domain.

(15) Leaving fire to burn unattended near any timber, causing such timber to be set on fire.

NOTE.—Paragraphs 3 and 4 do not apply to persons setting out back fires for the purpose of checking a fire actually burning at that time.

Montana fire laws.

Montana fire laws provide penalties for the following offenses:

(1) Refusal, without good and sufficient reason, of an able bodied citizen, between 18 and 50 years old, to fight fire when called upon by a fire warden.

NOTE.—No citizen expected to fight fire more than five days in one year.

(2) Destroying, defacing, etc., any fire sign posted under authority of the State.

(3) Carelessly setting fire to any timber, woodland, or grass, except for a useful or necessary purpose.

(4) Setting a fire for any purpose without taking sufficient steps to prevent its spreading from the immediate locality where used.

(5) Setting a fire and failing to extinguish it before leaving it.

(6) Wantonly or designedly setting fire to any timber or grass.

(7) Maliciously failing to extinguish a fire before leaving it (after starting it for a legitimate purpose).

Which law is applicable.

The question naturally arises at the time a fire trespass is discovered, Shall action be taken under the State law or under the Federal statute? It is difficult to lay down any general rule; it depends upon the circumstances of each individual case. In all cases where immediate action is not urgent, all the information obtained in regard to the trespass must be transmitted to the dis-

trict forester who will determine under which law the case should be prosecuted. Certain cases arise which do not come within the province of the Federal statutes and can not be prosecuted thereunder, and therefore must be taken up, if at all, under the State law. For example, Mr. A was burning brush on his own land, during the closed season in Idaho, without a permit, and a spark escaped to Government land, causing a fire. Mr. A did not set this fire with any other intention than to burn the brush on his own land. He had no reason to believe that such fire would be communicated to the property of others. He did not leave the fire to burn unattended, and he did not build the fire and, before leaving it, fail totally to extinguish it. In such a case he could not successfully be prosecuted under the Federal statute. On the other hand, under the Idaho law a prosecution might be commenced with a reasonable prospect of success. In Montana he could be prosecuted under the State law in case he had not taken proper precaution to prevent its escape.

Cooperation of State and county officials.

The attitude of State or county officials is also a factor of importance in deciding between the State or Federal law. Forest officers should know whether the active interest and cooperation of State and county officers can be expected. If quick action in prosecution and conviction is desirable, and the State law may be expected to act more rapidly, use that law, provided the active cooperation of the county attorney can be secured. But as a general rule, with the foregoing exceptions, the use of the Federal law is preferable.

State laws only apply.

Allowing a fire lawfully set to escape from the control of the person having charge, or allowing a fire to spread to the lands of another person, in both cases without using reasonable and proper precaution to prevent such escape, is an offense against the State, and should be prosecuted under the State law. The Federal law does not provide a penalty. If the fire was willfully set with the purpose of communicating it to other land, the Federal law would apply.

POWER OF ARREST.**Montana law.**

Under section 2072 of the Montana Code, all deputy game and fish wardens are fire wardens, and have power to arrest for violation of the fire laws. Only such forest officers as have been appointed State deputy game and fish wardens or deputy fire wardens, may make an arrest for violation of the State fire laws.

Idaho law.

In Idaho, section 12 of the act of March 11, 1909, provides that all forest supervisors, their deputies, and forest rangers are ex officio game wardens for their respective jurisdictions. Section 1605 and section 1611 of the act of March 15, 1909, authorizes all game wardens to make arrests for violations of the fire laws of the State. Consequently, in Idaho any supervisor, deputy supervisor, or ranger may make arrests for violations of the State fire law without special appointment.

Federal law.

Any forest officer (under appointment by the Secretary of Agriculture) has authority to arrest for violations of the laws or regulations relating to the National Forests. (Act of Feb. 6, 1902, 33 Stat., 700; and act of Mar. 3, 1905, 33 Stat. L., 872.)

Warrants.

Under the conditions previously stated a forest officer may make arrests without warrants for violations committed in their presence. If the forest officer has not actually seen the offender commit the act, and his arrest is necessary to prevent escape, a warrant must be obtained from the nearest United States Commissioner or State magistrate. This applies equally to the Federal and State laws.

PROCEDURE IN MAKING ARRESTS.**Notify district forester.**

Where an arrest is made, the hearing before the United States commissioner, or trial before the justice of the peace or other State magistrate, should, if practicable, be set far enough ahead to allow

time for the district forester to be notified and the assistant to the solicitor to attend the hearing. In all cases where such action is possible, the assistant to the solicitor will appear at the hearing and assist in the prosecution of the case. Full reports should be made for his guidance.

Federal law.

The arresting officer must take a person arrested without warrant before a United States commissioner, where he will be required to swear to a complaint; and must obey the mandate of the commissioner, who will set the time for a preliminary examination of the accused. The person arrested on a previously obtained warrant should be immediately taken before the United States commissioner who issued the warrant. The subsequent procedure will be the same as in the case of an arrest without warrant.

Complaint and warrant.

The officer seeking a warrant of arrest must designate in the complaint the particular offense committed and specify the statute and section violated. He must also be in possession of facts within his own knowledge, and not upon information and belief, which will convince the magistrate that there is sufficient cause for suspecting the guilt of the trespasser. Unless in possession of first-hand knowledge of the facts, the officer must have with him competent witnesses. A warrant can not be obtained until such facts are shown.

Secretary's regulations.

The Secretary's regulations have the force of law under the act of June 4, 1897, and violations of those regarding fire should be handled in the same manner as violations of the Federal fire laws, except in the wording of the complaint.

State law.

When the offender is not caught in the act, a warrant must be obtained from and returned to a State magistrate—that is, justices of the peace, police magistrates, in towns or cities, judges of the superior courts (county courts), and justices of the supreme court.

Preliminary hearing.

After the arrest the commissioner or magistrate will conduct a preliminary examination to ascertain whether there are sufficient facts to justify him in holding the suspect. Witnesses familiar with the facts should, therefore, be in attendance at such examination. Such witnesses should be subpoenaed. In the preliminary examination and at the trial, witnesses will, under the rules of evidence, be restricted in their testimony to facts within their own knowledge. Forest officers should bear this in mind, since it will aid them in determining whether they have sufficient evidence to sustain their charges.

EVIDENCE.

The evidence necessary to support criminal action must be clear, definite, and positive. It should be remembered that guilt must be proved beyond a reasonable doubt, and therefore the evidence necessarily must be stronger than in civil cases, where only a preponderance of the testimony is necessary to shift the burden of proof.

It is extremely necessary to trace the movements of the trespasser prior to the time of the fire, and also to show his movements thereafter, because they will in most cases have a bearing upon his previous actions. These facts tend to rebut any alibi which the trespasser may attempt to prove.

Important points of evidence.

In all cases as much as possible of the following information should be secured.

- (1) Time, place, and origin of fire.
- (2) Area burned over.
- (3) Estimate of probable damage, with basis for figures.
- (4) Map showing fire areas, status of land, roads, trails, buildings, etc.
- (5) Names and affidavits of witnesses, or statement of facts to which they can testify.
- (6) Name of trespasser in full.
- (7) His place of residence.

- (8) His occupation.
- (9) His whereabouts before the fire.
- (10) What he was doing while the fire was burning.
- (11) Any other evidence tending to prove the responsibility of the trespasser for the fire.

DETECTION.

Patrol.

Detection in the abstract is a perfectly logical division of the fire problem; it includes the distribution of the detection forces, the factors influencing the quick location of fires, the communication service by which the news will be reported to the control forces, and a discussion of the plan of organization, the equipment, and analysis of the type of personnel required. Considered with reference to actual conditions, however, the subject of detection can hardly be treated as something entirely separate and apart from other closely related parts of the fire problem. Detection is only one of the duties of the patrol force. Both prevention and control (first line of defense) form a part of the work. Therefore this chapter will be devoted to a consideration of fire patrol, its distribution, functions, equipment, and organization, always keeping in mind that one of the chief functions is detection.

Analysis of risk.

Two distinct classes of risk are recognized—fixed risk and blanket risk. Fixed risk is best typified by the fires resulting from railroads. It includes those areas where the record of fires shows that the risk recurs year after year and where the location of future fires may be predicted within certain well-defined limits. It includes all areas where the risk from any source is sufficiently condensed as to make it necessary to assign patrolmen without reference to the resources at stake in the particular locality. Blanket risk is that risk which is widely scattered with little or no tendency to recurrence in particular localities. It is, in fact, all the risk not classified under the term fixed risk.

Classification of patrol.

The primary purpose for which a patrolman is assigned to a certain station or beat determines the instructions given him, the equipment furnished, and to a large extent the type of man selected. The patrol force is therefore divided for convenience into primary and secondary patrol. The former is placed with reference to the fixed risk, and its function is to take all steps necessary to reduce the fire damage from this source. The latter is placed with entire reference to the blanket risk.

Primary patrol.

Primary patrol is based on the fundamental principle that wherever the location of fires can be foretold it is essential to assign patrolmen to discover and extinguish them. This is true regardless of the value of resources at stake or any other factor. If it is known with reasonable certainty where one or more fires will occur, the first assignment of the protection forces will naturally be to those areas. The ability to predict the approximate location of fires, or in other words, fixed risk, is the only factor considered in determining the number or distribution of the primary patrol. The functions of the primary patrol force are prevention, detection, and control; the three combined in one man. In certain places the prevention work is most important (e. g., along streams frequented by campers), in others control is most important (e. g., along railroads). Detection is always important, but it is also comparatively simple.

Secondary patrol.

Fires occur every year whose even approximate location can not be foretold. In order to locate and extinguish these fires it is necessary to scatter the patrol force in an effort to watch all parts of the Forest. The area of any Forest covered by secondary patrol is from 90 to 100 per cent of the total. The chief source of danger is lightning. The functions of the secondary patrol force are almost exclusively detection and control. Normally the two functions can not be combined in one man. The typical examples of the secondary patrol force are: The lookout man, whose duty is 99 per cent detec-

tion, and the smoke chaser, whose duty is 99 per cent control. This is a field of high specialization, and one in which the different parts of the organization must be closely coordinated. Each part of the machine is dependent upon some other part in order to complete the action and accomplish the purpose of the whole.

Distribution of patrolmen.

With this understanding of the purposes of the two classes of patrol and of the principles upon which the division is based, it naturally follows that the primary patrol force will be provided for before considering the needs for secondary patrol. All of the patrolmen needed to insure reasonable safety on areas of fixed risk must first be provided. The balance of the available funds will provide for the secondary patrol force.

Theoretically secondary patrol should be spread uniformly as possible over the Forest, so that each watershed is provided with ample detection and control forces. Naturally this will depend upon the standard of efficiency, the topography, and the limitations of funds. Actually, secondary patrol must be distributed in accordance with the location of valuable timber, the accessibility of different portions of the Forest, and with any decided variation in the risk.

Equipment for primary patrol.

Since primary patrolmen are expected to extinguish as well as discover fires the tools and equipment provided must be adequate for the purpose. There are two choices—either carry all tools necessary or distribute tools along the route of travel. The former is the best method where feasible. Below is given the minimum equipment which should be carried by each primary patrolman:

For motor cycle or railroad speeder patrolmen:

- 1 long-handled shovel.
- 1 grub hoe or mattock.
- 1 3-pound D. B. ax.
- 1 3-gallon canvas water bucket.

For horse patrolmen:

- 1 long-handled shovel.
- 1 3-pound ax.
- 1 grub hoe or cotton hoe (without handle).
- 1 3-gallon canvas water bucket.

For foot patrolmen:

- 1 knapsack.
- 1 3-pound ax.
- 1 cotton hoe (without handle).
- 1 pick, mattock and handle (Army intrenching tool).
- 1 canvas water bucket.

Equipment for secondary patrol.

The equipment for secondary patrolmen will depend upon their chief function. If this is detection, no equipment for control should be required if it would mean decreased efficiency in detection. For example, a patrolman is required to cover a certain beat on foot. His function is chiefly detection. Probably only one fire in ten which he could see would be close enough to make it practicable for him to put it out. Burdening him with tools for control would be poor policy, since the loss in efficiency in detection would be greater than the gain in control. On the other hand, a lookout man might not have occasion to extinguish a fire once in two or three years, but giving him all needed tools for control will not decrease to the slightest extent his efficiency in detection.

The following equipment will be considered standard for secondary patrol:

For lookouts:

- A standard fire observatory.
- 1 mounted and oriented fire map.
- 1 alidade.
- 1 pair 8-power field glasses (not yet available on requisition).
- 1 pair amber goggles.
- 1 wall telephone instrument.

For lookouts—Continued.

1 standard 5-man tool cache.

Camp equipment for number of men stationed at lookout and for visitors.

For horse patrolmen:

1 3-pound D. B. ax.

1 grub hoe or cotton hoe (without handle).

1 Adams portable phone (if telephone line is available).

For foot patrolmen:

1 Adams portable phone (if telephone line is available).

For smoke chasers:

With horses—

1 3-pound D. B. ax.

1 long-handled shovel.

1 grub hoe with handle.

2 8-inch files.

1 2-gallon water bag.

1 pocket compass.

1 map of forest.

1 fry pan, plate, knife, fork, and spoon, and quart cup.

3 days' selected rations (10 pounds).

1 blanket used as saddle blanket.

3 candles.

Matches in waterproof case.

Without horses—

1 knapsack.

1 Clack pack frame.

1 pocket compass.

1 map of forest.

1 3-pound D. B. ax.

1 long-handled shovel.

1 cotton hoe (without handle).

1 carborundum ax stone.

1 2-gallon water bag.

1 fry pan, plate, knife, fork, and spoon, and quart cup.

For smoke chasers—Continued.

Without horses—Continued.

3 days' selected rations (10 pounds).

3 candles.

Matches in waterproof case.

Personnel.

It is highly desirable to encourage men to enter the Forest Service fire-patrol work who can find other work locally for the balance of the year. The following usually make the best force, because a reasonable per cent can be obtained year after year: Prospectors, trappers, guides, lumber jacks, homesteaders, school teachers, and prospective forest officers, including students. Local men and those likely to be permanent residents should always be given preference. Small increases in pay should be recommended for efficient service after two or three years' work.

Qualifications.

A railroad speeder man must be quick and active both mentally and physically, and willing to take some chances. Dependableness is essential. A patrolman assigned to the task of watching campers or brush-burning fires must be the likeable sort—tactful, sympathetic, and able to secure the cooperation of the people with whom he comes in contact. A patrolman assigned either to a motorcycle or gasoline speeder should, of course, know something about machinery. A lookout man should be self-contained, self-reliant, steady, conservative, with good eyesight and keen perspective vision. Men between 30 and 50 years, who are familiar with the country, usually meet these requirements best. A smoke chaser should be familiar with the territory for which he is responsible, a good woodsman, and absolutely reliable. Forestry students are useful chiefly because of their enthusiasm, loyalty, and energy. They may be used as smoke chasers when it is possible to assign an older man to work with them, or as foot patrolmen, or as assistants to the district ranger.

Communication.

The standard means of communications for detection will be No. 9 telephone wire strung on either poles or trees in accordance with the instructions of the telephone handbook. All other means of communication will be considered temporary expedients. Emergency wire (No. 20) will be used to connect the main line with lookout points not distant more than 10 miles, if this connection is needed in order to test the value of the lookout point, or when funds are not available to construct permanent lines. Wigwag signaling is useful up to a distance of about 5 miles, and is very simple in operation. A pair of field glasses and a large flag are the necessary instruments. Heliograph is useful for signaling distances greater than 5 miles. It is useless except on bright days. Complete instructions for operating both wigwag and heliograph will be furnished by the district forester upon request. Heliograph instruments are only furnished by special request.

Lookout studies.

Studies are being carried on in certain parts of the district to determine the relative importance of factors affecting the efficiency of detection from lookout points. These include the effect of sun and haze on the range of direct vision, the depth of canyons, the weight of the atmosphere, and the direction and velocity of the wind. Probably the most important influences are the position of the sun, the depth of canyons, and the direction of the wind. The greatest range of vision is obtained when the sun is directly at the back of the observer. It is questionable whether any lookout will be able to detect a smoke which must rise more than 200 feet before becoming visible quickly enough to maintain the standard desired.

Fire observatory.

Standard plans and specifications for the construction of buildings and towers on lookout points are available and will be sent upon request. The exact height to which to build a tower or house in order to place the observer at an elevation which will give an unobstructed view can be determined in the following manner:

Run one or more lines of levels across the crest of the mountain and far enough down on the sides to reach the objects which limit the vision. An Abney level is sufficiently accurate. By plotting the elevations and calculating the vertical distance between the intersection of tangents representing the clear line of sight and the actual top of the peak, the desired height of the house or tower can be determined.

CONTROL.

Divisions of subject.

This subject will be discussed under three broad divisions—preparation, mobilization, and suppression. Preparation will be a consideration of all steps in advance of actual fires believed to be necessary on every Forest and for the district as a whole. Mobilization will be a consideration of the more specific steps to be taken in getting men, supplies, and tools to fires actually burning. Suppression will include the strategy, tactics, and organization of the fight to control and extinguish individual fires.

1. PREPARATION.

CENTRAL WAREHOUSES.

Location and contents.

Three district warehouses, stocked with all supplies (except food) needed for large fire crews, are located at Missoula, Kalispell, and Spokane. Each warehouse will, as rapidly as funds permit, be stocked with kitchen, mess, pack, bed, camp, and fire-fighting equipment needed for 500 fire fighters. Some special equipment not ordinarily available on the Forests will also be kept in stock, such as force pumps and hose, gasoline engines, office kits, communication kits, etc.

Object.

The object of the warehouses is—

- (1) To make available more complete and serviceable equipment than is locally available for purchase.

- (2) To reduce the cost of fire fighting by buying all equipment needed for large crews in wholesale lots.
- (3) To reduce the investment needed for this class of equipment on the individual Forests.

Policy.

No more equipment of the class held at the warehouses will be purchased by the Forests than is needed to supply crews for a normal fire season, or for crews which could not logically be supplied with sufficient dispatch from the warehouses.

Officers in charge.

The Missoula warehouse will be under the direction of the district forester, that at Kalispell under the direction of the supervisor of the Blackfeet Forest, and the one at Spokane in charge of the supervisor of the Coeur d'Alene Forest. The district forester will, of course, exercise general control over all three. Shipping clerks will be constantly on duty at each warehouse during an emergency fire season.

How and when to order.

Requisitions will naturally be sent by wire or by telephone. They should be directed to the officers named above, unless otherwise instructed. Requisitions for all fire supplies (except food) not available on the Forest, and which it would be otherwise necessary to purchase, should be sent to the warehouses. Exceptions must be made in all cases where serious delay would result in following this plan. The general scheme will be to keep at each Forest headquarters a small supply which can be kept up by requisitions on the warehouses. Orders should, as far as possible, be in conformity with the standard lists and standard terminology shown in the Appendix. For example, if ordering equipment for 20 men, state specifically that this means kitchen, mess, camp, bed, and fire-fighting equipment or only certain parts. By reference to the standard lists it will be easy to specify additional articles which may be required. If food is wanted, it can be purchased by the custodian of the warehouse and shipped, if specifically mentioned.

SUPERVISOR'S HEADQUARTERS.

Division of responsibility.

The forest clerk should usually be considered as the permanent quartermaster for the Forest. He should be given specific instructions covering the action necessary in filling requisitions from the field for fire supplies. The exact procedure must be fully worked out in advance and all equipment prepared for quick shipment. His authority in employing special assistance to fully handle the work of a quartermaster in emergencies must be outlined. Quick response to fire calls and active interest in the work are essential.

Special forms.

A form should be prepared for use at each headquarters in recording currently all the essential information concerning each fire and in reporting the situation promptly to the district forester. A summary of the fire plan for the Forest and for each district should be always at hand for ready reference.

Inspection.

A thorough inspection of the preparations throughout the Forest should be made annually before the fire season opens and, as far as practicable, currently through the season. The inspection will cover particularly the tool caches and their distribution, the condition of all tools, equipment, trails, telephone lines, telephone instruments, pack animals, and any especial hazards, such as slashings.

A memorandum record of the inspection of each district is advisable, showing the weak spots and the action taken by the inspector to strengthen them or the plans made to improve conditions later on.

FIELD.**Tools.**

The distribution of tools will be considered under two classes: (1) tool caches and (2) tool reserves. Tool caches are the tools placed so as to be available primarily for the second line of defense. Tool reserves are the tools held in readiness for the third line of defense. The first line of defense will be supplied with separate tools.

Tool caches.

Tool caches rarely contain tools for more than 5 men, placed at strategic points along roads and trails throughout the Forest. Either open racks or tool boxes may be used. Some form of galvanized-tin box fastened with a seal is preferred. If open racks are used, the tools must be removed during the winter to a place where they will be protected from the weather.

Every tool cache must be provided with a suitable sign.

Contents.

West of the continental divide a standard 5-man tool cache will contain:

- 3 D. B. axes.
- 3 mattocks or grub hoes.
- 2 shovels.
- 1 2-gallon water bag.
- 6 8-inch files.

East of the divide:

- 3 D. B. axes.
- 1 mattock or grub hoe.
- 4 shovels.
- 1 2-gallon water bag.
- 6 8-inch files.

Slight modifications of this standard will be necessary to meet special conditions in some localities. It is rarely advisable to include crosscut saws; they are expensive and very likely to be stolen.

Tool reserves.

The general tool supplies of the Forest, or tool reserves, will be located only at points where fire fighters would naturally be assembled in going to a fire, at the Forest headquarters, at ranger stations, and perhaps at other strategic points. Contents will preferably be made up for units of 10, 20, and 50 men; standard lists for each are given in the Appendix.

Maximum limit on tools.

The amount of money which it is advisable to invest in tools for any Forest depends upon the resources, risk, accessibility, and other fire-protective factors. These factors have been considered in distributing the patrol money, and therefore the amount invested in tools should have some relation to the amount allotted for the patrol force. The maximum number which will be allowed for any Forest, without the specific approval of the district forester, will be tools for 80 men for each \$1,000 regularly allotted for patrol. For example, a Forest whose patrol allotment is \$5,000 would be authorized to buy tools, as rapidly as funds are available, for 400 men. This maximum is, of course, only a guide. Certainly no more tools should be maintained on a Forest than a careful study of conditions indicates is needed. The maximum must not be exceeded without the specific approval of the district forester. The central warehouses should take care of the larger emergencies. The tools should ordinarily be divided about equally between the caches and the reserves. This is governed, however, by the relative dependence upon second and third lines of defense.

Other equipment.

The quantity of all other equipment, such as kitchen, mess, bed, pack, camp, should be gauged by the number of men provided for by the tool reserves. Tool caches should not be considered. Lists of such standard equipment will be found in the Appendix.

Sharpening tools.

Fire equipment must be kept in repair currently, and tools must be kept sharp. Enough men should be retained at the close of every fire fight to put all tools used in first class condition.

To prevent rust.

Use crude vaseline, or some equally good preparation, to cover all tools and equipment liable to rust. Vaseline is easily removed with hot water.

Responsibility of ranger.

Within his district the ranger is responsible for all fire preparations in accordance with the approved fire plan. The correct distribution and condition of all tools and equipment is particularly important. The ranger should promptly notify the supervisor in any case where he is unable, with the resources at his command, to comply with the instructions of the fire plan. The responsibility for providing the necessary assistance will then rest with the supervisor.

Testing telephone lines.

Dependable communication service can be maintained only by systematically testing the telephone lines at regular intervals. Trouble must be immediately followed up and corrected. Early morning is the best time to test the lines.

2. MOBILIZATION.**Graphic records.**

Each Forest and ranger district headquarters should have on file complete mobilization plans for reference in case of fire. This record should be in the form of charts, diagrams, or other graphic plans. A suitable chart has been prepared for summarizing such information for each ranger district. This form will be made available at once.

EMPLOYMENT OF MEN.

During emergency seasons Forest officers will be placed by the district forester at central labor points, such as Spokane, Missoula, Kalispell, and Great Falls, to handle requisitions for fire fighters which can not be filled locally. Each Forest will, of course, employ men locally so far as possible.

Methods.

The methods of securing labor will necessarily vary with the conditions of the labor markets. Three methods might be used:

- (1) Direct employment by the forest officer.
- (2) Employment through free municipal labor agencies.
- (3) Employment through commercial labor agencies.

The first method is the most satisfactory where comparatively small numbers of men are needed. The usual difficulty, however, is the unfamiliarity of the forest officer with the quickest means of getting the men, the need for experienced men to assist, and the lack of a central office where the men can be assembled. Wherever these difficulties can be overcome there is no necessity of using other methods. The advantage of the second and third methods is the availability of an organization well equipped to do the work without unnecessary delay. Municipal agencies will be used if they have the inclination, the ability, and the machinery to meet the need. They should be carefully investigated before depending upon them for results, and if not satisfactory, the commercial agencies should be used. The latter usually charge \$1 for each man employed. The Forest Service can, if absolutely necessary, pay this amount; but except in very unusual circumstances the employment office will be instructed to accept only men who are able to pay the price charged. The payment of \$1 is some little guarantee that the laborer really wants work and not simply transportation to some point.

Selection.

No matter what method is employed to secure the men, the forest officer should see that the selections are carefully checked and all men not suited for the work of fire fighting weeded out. The weeding-out process must be largely a matter of judgment based on the physique and general appearance of the men. Fire fighters must be strong, active, able-bodied men, with good feet and reasonable endurance. The class of men needed is the lumberjack type. Men who clearly give evidence of being unaccustomed to manual labor should be rejected. Never accept men to fight fire simply to make up the total number ordered; better be 25 per cent short at the employment end than the second day after the men reach the fire. In selecting fire crews make haste with sufficient deliberation to insure getting the best men available.

Classes of men.

If a choice is possible, it is particularly important to make up at least one-third of each crew with men who have had some experience as axmen and sawyers. It is desirable to have one or two men qualified to file saws if they are available. A special effort should be made to keep a line on cooks, packers, filers, and men qualified to act as foremen or straw bosses, and send them out as requested.

Railway transportation.

Every crew transported by rail should be accompanied by a forest officer, a labor agent, or other reliable man. Transportation requests will be used to pay railway fares. If meals en route are needed, provide each man with a lunch, or arrange in advance for meals at some convenient lunch counter, giving the men the Forest Service meal tickets.

Personal supplies.

Good shoes with nails or carks and warm clothing are needed for every fire fighter. Men already supplied with these necessities will, of course, be given preference. The needs of each man should be checked and a record made of the size and kind of clothing he is willing to pay for. These articles should either be purchased, marked clearly for whom intended, and forwarded to the project quartermaster for delivering to the man after reaching the fire camp; or the record should be sent to the quartermaster so that the needed articles can be sent to the camp immediately following the men. Unless otherwise instructed, necessary clothing will be purchased by the employing officer and forwarded by express or parcel post to the project quartermaster.

Employment records.

Each fire fighter employed will be required to sign in duplicate the standard form for contract of hire. The employing officer will also sign the contracts, deliver the original to the fire fighter, and retain the duplicate for his records, later to be turned over to the supervisor. Each man will also be given an identification card, to be retained by him until he reaches the fire camp. It is important that the serial numbers be kept and that each card number be iden-

tical with the employment contract number. No man should be promised other than a laborer's wage (25 cents per hour) unless the order for men specifically calls for a higher class.

How to order men.

In sending requisitions for men to the employing officer state specifically:

- (1) The total number of men.
- (2) The number of cooks, packers, filers, foremen, etc., to be included.
- (3) Date men wanted.
- (4) Destination.
- (5) Total travel time to be allowed on contract of employment.
- (6) Whether or not clothing needed should be purchased by employing officer.

It should be remembered that the employing officer has been instructed to take sufficient time to select the best men and to make all necessary records. Sufficient assistance will be given each employing officer so that no delays which can be foreseen will result. Forest officers should understand, however, that some delay not only can not but should not be avoided if the business of employing men is to be efficiently and economically handled.

PROJECT QUARTERMASTER.

Division of duties.

The work of a project quartermaster includes the following:

- (1) Purchase or requisition of all supplies.
- (2) Renting or hiring of any equipment needed.
- (3) Requisition for or direct employment of labor.
- (4) Feeding of men en route.
- (5) Transportation of men and supplies from base to different fire camps.
- (6) Payment of fire fighters.
- (7) Keeping track of property.
- (8) Complete records of disbursements and liabilities, including time of packers, pack animals, wagons, and other forms of transportation.

The extent of the organization needed depends upon the volume of business. For large fires there will be needed a paymaster provided by the district forester or supervisor, a clerk, a pack master, and perhaps a shipping clerk, as well as cooks, messengers, packers, etc. The size and scope of the organization built up must be left largely to the judgment of the quartermaster or to the direction of the district ranger or supervisor. For small fires one man is usually sufficient. The quartermaster must be a forest officer familiar with Forest Service forms and procedure, and capable of expanding or contracting his organization to meet all demands, and distributing and defining the responsibilities of his subordinates.

Quartermaster stores.

In order to keep the fire camp, or camps, supplied with all necessary equipment, the quartermaster must establish and maintain a reserve store, which will contain all of the supplies and equipment listed in the Appendix. The size of the reserve store will depend upon the following factors:

- (1) Length of time required to secure the equipment from the nearest merchant who is in a position to fill orders from his stock.
- (2) Number of fire fighters being supplied and rate of consumption.
- (3) Chances for increase in numbers of men either by expansion of crews already working or by the addition of new camps.

The quartermaster must be in a position to fill orders from the fire camps without serious delay and must therefore anticipate the needs of each. Ordinarily he should keep on hand about four days' supplies of food and personal commissary and a surplus of fire tools equal to about 20 per cent of the total quantity on the fire line. The surplus tools should be mainly axes and shovels, with a much smaller quantity proportionately of mattocks and cross-cut saws.

If the chances seem to be in favor of expansion rather than contraction of the fire fighting, complete additional equipment for a new camp of from 20 to 50 men should be kept in stock.

Inventory.

A complete current inventory of all supplies and equipment in the reserve store must be kept, classified in accordance with standard lists shown in the Appendix. It is also advisable to establish maximum and minimum limits above or below which the stock will not expand or contract.

Filling orders.

Orders for supplies from the fire camps are usually made out by the timekeeper in each camp, and are not often closely checked by the fire chiefs. The regular form provided for this purpose shows the supplies on hand as well as those ordered. The quartermaster, with this information, knows currently just what supplies each camp has, and is in a position to intelligently reduce or increase the amounts shipped in accordance with the supply in stock and the transportation facilities available.

Food reserve in camps.

The quartermaster will attempt to keep each camp supplied with from two to six days' supply of food, depending upon the distance of each camp from the base of supplies, the reliability of the transportation service, and the status of the fire. Frequent consultation with the fire chiefs, when possible, will enable the quartermaster to avoid having a large surplus at the close of the fight.

Transportation service.

The transportation service should, so far as practicable, be handled on regular schedules. This is particularly important where pack trains are used. Supplies should be cargoed in accordance with the capacity of the means of transportation. This requires a shipping clerk or pack master familiar with the limitations of the service.

Waybills.

The description, labels, and number of packages of each load must be listed on a waybill provided for the purpose. The waybill will be signed by the officer making up the load, by the chauffeur,

teamster, or head packers en route, and by the timekeeper at the fire camp. The load will also be accompanied by a detailed list of the contents to be checked by the timekeeper at the fire camp. This list will usually be made in the column provided on the original order submitted by the timekeeper.

Fire fighters en route.

The quartermaster will be responsible for men going to the fire until they reach the fire camps. Where necessary, cook houses will be established at the base of supplies and at halfway points along the route. Fire fighters will always walk over trails, and usually each man will be required to carry his own bed. At the points of disembarkation (the point where the men leave railroad, boat, or automobiles) the quartermaster will see that the travel time allowed for the remaining distance is recorded on each man's identification card. Fire fighters' extra baggage will be checked by the quartermaster and left at the base of supplies.

Cost records.

The quartermaster will keep a detailed account of all liabilities incurred for the fire or fires for which he is responsible. This record will be in the form of duplicate invoices and bills of all goods purchased, memoranda of contracts of hire, and time slips for pack animals, teams, and automobiles, and for employees working under his direction. With the paymaster's record of disbursements for labor, this should give the supervisor a satisfactory estimate of the total expense. It is important that a record of all purchases made by other forest officers for this fire or fires be sent promptly to the quartermaster. The final statement should segregate the cost of individual fires, at least approximately, and must show the complete list of articles of personal commissary.

Disposition of surplus stock.

All purchases should be made with the distinct understanding that any surplus undamaged stock will be returned to and accepted by the merchant. The final inventory will separate the damaged

and undamaged stock. All food supplies and articles of personal commissary which will be accepted will at once be returned to the merchant and credit slips filed with the records. The disposition of the remaining stock will be in accordance with instructions from the supervisor or district ranger. All nonexpendable property left in stock will be turned over to and signed for by the district ranger unless otherwise instructed. The quartermaster should remain on duty until all final arrangements are completed.

3. SUPPRESSION.

This subject will be divided into (1) methods of fire fighting, and (2) organization on the fire line. Methods will be further divided into strategy and tactics.

METHODS OF FIRE FIGHTING—STRATEGY.

Size of crew.

When the first line of defense reports its inability to extinguish a fire, and it is necessary to call out the second or third line, the first problem is to decide the number of fire fighters needed. Some of the factors which determine the size of a fire crew are area covered by fire, dryness of season, wind velocity, type of timber, inflammability of ground cover, and liability involved. The date and the number of men available are also important considerations. If the fire occurs very near the close of the usual fire season, a smaller crew would ordinarily be dispatched than if the date was early in the season. It is desirable to secure a sufficiently large crew to make it possible to completely surround the fire during the first 12 hours. In emergency seasons fires often spread so rapidly that this is impossible. In this case the crew should be enlarged as rapidly as the necessary organization to properly direct, feed, and transport the men can be expanded. Necessary economies in fire fighting expenditures will be an additional factor to be considered by the fire chief. The policy to be followed is expressed in a general way in the chapter on finances.

Location of camps.

The next problem is the location of the fire camp. The closer to the fire the camp is placed the more effective is the labor of the men in suppressing the fire. Walking over steep ground or through brush and windfalls is more wearing on the crew than the construction work on the control line. If there is any safe camp ground near the fire the camp should be located at that point, even if it is necessary to cut a trail to reach it.

Trail to fire camp

Camp will be first located at the nearest available site, and all or part of the crew used to build the trail. It is often feasible to send part of the crew ahead to the fire with man packs and sufficient food for several days. The advance guard can then begin work on the control line while the balance of the crew is building the trail. In such cases it is usually necessary to assign several men to the work of carrying equipment and supplies to the new camp until the main camp is moved. A good trail (at least sufficient for foot travel) should always be made leading from the final camp to the nearest point on the control line.

Safety of fire camps.

Not very many absolute rules for the location of the camps with reference to the safety of the crew can be given. It is a matter of first importance and must be carefully considered by the fire chief. Ordinarily the camp should not be located above the fire or to the leeward of it. Exceptions would be where the camp can be placed in an opening or scattering timber where it can be easily defended. In an open yellow-pine stand a trench around the camp will usually be sufficient protection. In spruce or white pine there is real danger both to the men and to the camp paraphernalia. If there is no opportunity to place the camp out of the timber, locate it to windward or to one side of the fire and preferably adjacent to the control line. In an emergency the camp can then be moved into a part of the burned area on which the fire has been extinguished.

General perspective of fire.

Before the attack can be planned with intelligence a general perspective view is necessary. The fire chief should, where at all possible, personally visit on the first day all sides of the fire. If time permits, this should be done in advance of the arrival of the crew; if not possible, start the crew at work on the control line at the most obvious point and change the plan only after thorough investigation. The fire chief should learn the location of the head of the fire, its origin, the direction of the prevailing wind, and the character and type of timber and country surrounding the fire area. Scout service, as later defined, will keep the fire chief informed of conditions subsequently, if he does not find time to personally investigate.

Plan of attack.

In the great majority of cases a forest fire is fought by clearing a right of way of all inflammable material ahead of the flames and supplementing this with a narrow trench or trail dug to mineral soil. The right of way is theoretically made wide enough to stop the progress of the flames. It is extended to cover the complete circumference of the fire. This combination of clearing and trench or trail is known as a control line. Except where natural fire breaks make it unnecessary, every timber fire should be completely surrounded by a continuous control line. The width and character of the right of way, and the distance from the edge of the fire will vary with the type of forest and the rapidity of advance of the fire. The location of the first point of attack and the subsequent extension of the control line will depend upon the character of the country, the direction and velocity of the wind, and the steepness of the slopes. As most of the National Forests are mountainous, the factor of slope will nearly always have to be considered.

Attack at the head.

The most obvious point to attack a fire is on the side toward which it is running most rapidly, which would ordinarily be on the uphill side. If the fire is small and the crew large enough to cut it off and surround it in a short time, that would ordinarily

be the best procedure. To attack a fire at the head, however, always involves a considerable danger of an advance of the fire on the flanks, which might lose everything previously gained.

Attack on the flanks.

If the fire has reached considerable size and is advancing rapidly, and it is obvious that it is going to take considerable time to surround it, the control line should begin near the rear of the fire and advance along the flanks toward the head. In that way the danger of losing the line through a flanking fire is greatly reduced. The crew may be split, and each half take one side of the fire, beginning at the bottom of the hill (or on the windward side if the country is level or rolling), and advance the control line along each wing, gradually pinching the fire out at the head where the two crews will meet. Even a very bad and rapidly advancing crown fire can often be mastered in this way. The head will probably be checked normally when it reaches the top of the first ridge; the checking of the flanks by the advancing control line will reduce the draft by decreasing the volume of heat, and the head of the fire will be easier to stop when the control line reaches it. In some cases it may be desirable to place a portion of the crew at work on the head, while the main crew is constructing the control line along the flanks of the fire.

Very large fire.

These statements refer generally to a fire of medium size (up to 200 or 300 acres). A very large fire presents a much more complicated problem, since it may have several heads, or points of rapid advance, and cover several slopes and ridges of varying aspect. The same general principles, however, will hold.

Natural fire breaks.

Full advantage should be taken of natural features, such as areas of slide rock, streams, barren ridge tops, land slides, etc., which may partially cut off the spread of the fire. It will often be necessary to supplement immediately such natural breaks if they are

not continuous. For example, a short fire line across a timbered saddle in a rocky ridge might complete the defense on one side of a fire.

TACTICS.

Location of control lines.

The fire chief, or some qualified man designated by him, should blaze a line to guide the crew in constructing the control line. The line of blazes should not at one time provide for more work than the crew can do in one-half day. Even then it may be necessary to change the location to fit the changing conditions of the fire.

Control line adjacent to edge of fire.

The question of the location of the control line at the edge of the fire or at a distance is still somewhat open to debate. It depends upon circumstances and also upon individual opinion. Men of experience do not entirely agree on this point. The most commonly accepted practice is to locate the control line within a few feet of the edge of the fire. The fire is then checked when the control line is completed and only a short period of watching until the fire burns out is needed.

Away from edge of fire.

In general there are three reasons for locating the control line at a distance from the edge of the fire:

- (1) If the fire is too hot to permit working near it.
- (2) To take advantage of better ground, or to utilize an existing trail, road, or some natural firebreak.
- (3) To shorten the length of the control line by avoiding sharp bends and indentations in the edge of the fire.

When fire is too hot.

In the first case there is apparently no choice. One alternative, however, should be considered. The head of the fire only may be burning fiercely; it may be possible to begin work on the flanks, where the heat is usually less intense. By starting near the rear

and working close to the fire along the flanks, the head may be pinched out or forced to a ridge top where there is less inflammable material. In some cases the control line can be kept near the edge of the fire by working only in the early morning and late evening and using the whole crew to patrol the completed line during the heat of the day.

To avoid difficult construction.

If the construction of a control line near the edge of the fire is very expensive or very difficult, and there is an opportunity to accomplish the same purpose cheaper, quicker, and with less difficulty at some distance away, there is every reason for adopting the latter alternative. Caution must be used, however, since a change in the wind or a variation in the slope may bring the fire to the control line with such a rush that it can not be stopped. If the fire is in valuable timber, this plan means the certain loss of more timber than may be necessary. A fire burning in a slash can often be stopped easily, cheaply, and without any loss of valuable timber by constructing the control line in the edge of the green timber.

To reduce the distance.

If the edge of the fire is very irregular the distance around it can be greatly reduced by "cutting the corners." It is usually unnecessary and more expensive to follow all of the contours of the fire. The unburned points must, however, all burn out before the fire is under control. If back-firing is considered unsafe it is better to follow the exact contour of the fire.

Avoid highly inflammable débris.

Attempt to locate the control line so as to avoid having highly inflammable débris just inside the control line. For example, if, in blazing the line, there is encountered a pile of logs already burning, the control line should be thrown back at least 25 or 30 feet from the burning logs. If they have not yet caught fire, the line should be built so as to exclude them from the fire area. Large logs lying parallel to the direction of the control line should always be left

outside the fire area. If the control line can not be located between the logs and the fire it should be thrown back so as to leave a wide margin.

Avoid sharp turns.

Very sharp angles in the control line should be avoided. Where necessary to change the course, make the turn gradually. The straighter the line, the easier it is to hold against a hot fire or a treacherous wind.

Right of way clearing.

The width and character of the clearing vary with the conditions. In open yellow pine, fir, larch, or lodgepole, or through old burns, the right of way should be cut from 8 to 10 feet wide, removing all logs, rotten wood, and undergrowth. In heavy green timber, such as white pine or spruce, the clearing should be wider. Frequently the first clearing is made only from 10 to 12 feet wide and afterwards reinforced on the side toward the fire by cutting all dead snags, young growth, and trees with low branches, particularly if they are covered with moss. This supplementary work will often cover a strip from 50 to 100 feet wide. Tall green trees with trunks clear of limbs for 15 feet or more seldom need to be cut.

Disposal of material cut.

All material cut on or near the control line should be thrown away from the fire. The following exceptions may be noted: When the fire is so close that there may be danger of throwing fire outside the line; when the control line is on a steep slope above the fire and it is easy to throw the material cut a considerable distance inside the line; when the line is to be immediately back-fired and the material is needed to give the back-fire momentum. Under ordinary conditions, if the material cut in clearing the right of way is banked on the inside of the control line, it will create such a hot blaze when the fire reaches it that the control line will be held with difficulty, if at all.

Fire trench.

The fire trench or trail is placed in the center of the clearing, or preferably on the side away from the approaching fire. On level ground or on a slope above the fire it consists merely of a strip cleared of roots and duff, so as to expose the mineral soil. The width varies from 2 to 3 feet (rarely as wide as 4 feet), depending upon the severity of the fire and the rapidity of its approach. On level ground a width of from 2 to $2\frac{1}{2}$ feet is usually sufficient. On slopes above the fire a wide flat trail, with a minimum width of $2\frac{1}{2}$ feet, is required. On slopes below the fire a deep cup-shaped trench from 2 to $2\frac{1}{2}$ feet wide is required. The earth must be well banked upon the lower side in order to catch burning cones and embers which roll down the hill. A control line in such a location is always hard to hold. Logs and stones frequently break loose from above and roll or shoot down the hill and across the trench, carrying fire with them. Where the control line runs straight up a steep slope, the trench should be further reinforced by placing earth dams across it at frequent intervals.

In any situation a fire trench is not complete until all roots are cut off and absolutely all rotten wood is removed. It is particularly important to thoroughly dig up the soil at places where rotten logs are removed from the trench. Sufficient mineral soil should be removed to cover any duff or inflammable material exposed on the side of a trench away from the fire. If there is plenty of loose earth, throw it both ways, covering both the outside of the trench and the approach to it. Use a plow instead of mattock in making the trench wherever its use is feasible.

Back-firing.

As a general rule, whenever the control line is placed at a distance from the edge of the fire the area between should be back fired. Never try back-firing until the control line is completed, and then only upon specific instructions from the fire chief. Unless the fire is stopped by moisture or dies out through lack of combustible

material, the strip between the control line and the fire must, sooner or later, burn over. It is better to choose the most favorable time to back-fire the strip than to take chances on losing the line when the main fire approaches. Even if conditions are adverse, with the wind blowing across the line and the weather hot and dry it is worse than useless to dodge the responsibility. The main fire is bound to strike the control line. It is safer to attempt to hold the back-fire, working from the control line against the wind, than to take chances on stopping the main fire when it strikes the line with the momentum given it by the adverse wind. If it is considered advisable to wait, start the back-fire in the late evening, at night, or early morning. The wind at night frequently blows in the opposite direction from that prevailing during the day. Study the wind currents at all stages of the fight. Back-firing is often difficult in the early morning, on account of the dew. This is particularly true late in the season. Usually late evening offers the most favorable time to back-fire.

How to back-fire.

If a strong wind is blowing across the line, start the back-fire immediately adjacent to the trench, confining it to a strip commensurate with the crew available to watch it. A part of the crew should be stationed back of the control line to extinguish falling sparks. If the air is still or the wind is shifting, start the first fires from 50 to 100 feet distant from the trench. This will tend to throw the balance toward the main fire and create a draft in that direction. As soon as the first fires are under way start others adjacent to the trench, as before.

Torches are usually necessary to start the back-fires. If the usual brush burning torches are not available, wrap burlap around a piece of heavy wire and soak the burlap in kerosene. Use two torches alternately, keeping one in the kerosene while the other is in use. Better torches can be made by rolling burlap into tight bundles which will just fit into tin cans from which the tops have been

removed. Wire or nail the cans to suitable poles. After soaking several hours in kerosene the torches will furnish a good blaze for a considerable period. If the forest is very dry, back-fires can often be started with matches, but usually this method is too slow. Back-fire the line one section at a time, watching each one until the danger is over.

Use of water.

The use of water in fire fighting has in the past been limited mostly to small fires, because of the practical difficulties in getting it to the points where needed. Recently, however, it has been demonstrated that water can be employed on a larger scale by utilizing pumps and hose, and its use in the future will undoubtedly increase. Water has been used successfully for the following purposes: In holding back-fires; in extinguishing the fire as it reaches the control line; in putting out small patches of fire which jump the line; in putting out fires in snags, old logs, and in duff; in completely extinguishing fires on small areas; and to defend the fire camp in dangerous places.

Spray pump.

Several types of spray pumps have been tested. The most satisfactory is a tank spray pump similar to the one manufactured by the Hardie Manufacturing Co., of Portland, Oreg. This pump weighs about 10 pounds empty and holds three gallons of water. It is fitted with an air pump which gives the pressure needed to throw a steady stream 30 or 40 feet. Such a pump is most useful in patrolling the line after the fire is under control, in extinguishing fire in snags, and in putting out small fires. The use of such pumps is still in the experimental stage, but they give promise of being exceedingly valuable.

Force pumps.

This class of pump has been sufficiently tested to prove its usefulness beyond question. The pump tested and found satisfactory

is manufactured by F. E. Myers & Bros., Ashland, Ohio. Following is the technical description:

The Myers Century Low Down Double Acting Force Pump No. R 286, with cog gear handle, and 3-inch brass-lined cylinder. Code word "Palama." Weight, 75 pounds. Local agents:

McGowan Bros. Hardware Co., Spokane, Wash.

Kalispell Mercantile Co., Kalispell, Mont.

Missoula Mercantile Co., Missoula, Mont.

Fittings required:

I dozen log screws, $\frac{3}{8}$ inch by 3 inches.

1 14-inch combination engine wrench.

1,000 feet (more or less) $\frac{3}{4}$ -inch cotton garden hose.

1 brass nozzle with stop cock.

For discharge:

1 $\frac{3}{4}$ -inch female hose connection.

1 $1\frac{1}{4}$ -inch to $\frac{3}{4}$ -inch reducer.

1 $\frac{3}{4}$ -inch close nipple.

For intake:

12 feet $1\frac{1}{4}$ -inch suction hose with strainer.

1 $1\frac{1}{4}$ -inch by 6-inch nipple fastened to intake with clamp.

1 $1\frac{1}{4}$ -inch close nipple (3 inches).

1 $1\frac{1}{4}$ -inch union.

The above outfit has been successfully used with as much as 1,500 feet of hose. The whole outfit costs between \$100 and \$125. Usually four men are required to work the pump, which is fastened to a log, working alternately in two-man crews. To properly handle the hose requires about one man for each 400 feet. Water can be raised above the intake a vertical distance of from 100 to 200 feet. The pump discharges 0.15 gallons of water per stroke, or about 10 gallons per minute.

Gasoline engine and pump.

Prospects are very good for obtaining in the near future a portable outfit consisting of a gasoline engine, pump, and pressure hose which will lift water a vertical distance of 500 feet above the intake. Such outfits will probably be kept in the district warehouses to be dis-

tributed as needed. They should make the use of water possible in a great many more fires than at present. They will be used in connection with the force pumps already described. This equipment is still in the experimental stage.

Patrol of line.

The problem of holding the control line once it is completed is all important. Every foot of control line which is held reduces the total acreage covered by the fire. If even small progress is made each day in advancing the control line and all of the line previously constructed is held, success will eventually be sure, even though the head of the fire is temporarily advancing faster than the control line. The addition of more fire fighters, perfected organization, increase in efficiency of the men, or more favorable conditions will certainly enable the crew to reach and stop the head of the fire within a short time.

As the construction work progresses the patrol organization for the completed line should immediately follow, taking men from the construction gangs. In some cases it may be necessary to put the whole crew on patrol for a few hours in the afternoon. The important thing is to hold every foot of the line once gained.

Patrolmen should take advantage of breathing spells to widen the control line at dangerous points and to loosen the mineral soil at convenient places for use in stopping the fire when it threatens to jump the line. If the fire is burning quietly, allow it to burn everything clear to the trench; stop it with dirt or water only when it threatens to jump. A burning log is better disposed of by rolling it away from the trench and allowing it to burn up than by smothering it with earth. If the fire is rushing the line and throwing sparks and burning moss from fire in the crowns, scatter a few men back of the line to put out sparks as they fall.

Finishing work on the line.

When the fire is completely surrounded by the control line, the work is by no means completed. The crew should not be reduced until the fires inside the line have been reduced to mere smouldering patches. Reduce the crew gradually and cautiously. A high wind

may fan the smoldering fires into flame which will spread across the control line. There is also a real danger that a high wind may cause a crown fire to sweep over an area previously burned by a surface fire.

The first work is to supplement the patrol force by gangs of men who will widen the clearing by cutting mossy or "fuzzy" trees, back-fire unburned strips, cut dead snags or bank them with dirt, construct dams, or man the pumps. After the fire has ceased burning except in spots, the gangs should proceed inward from the control line, covering with earth (or better, burying) all burning logs and cutting and smothering burning snags. As less and less fire is found the men should resort more and more to digging deep holes and burying the fire. Persistently burning large logs and stumps should be smothered with earth. The following day remove the earth and chop off the burning wood and again smother with earth. Interior unburned areas may be saved by the construction of supplemental fire lines.

When the fire is out.

Keep one man to watch the burned area for at least three days after the balance of the crew is disbanded. It is all important to make sure that no smoldering fire, which can not be detected, does not fan into life and start the fire afresh. If the area can not be closely watched by the regular detection force, it is better to keep one man on the job until rain or snow falls than to take any chances on a new outbreak. The effect of a light rain is often very deceiving; be sure the rain has actually put the fire out before leaving it.

Fire fighting rules.

- (1) Always trench a timber fire. Do not try to put it out by shoveling dirt on it or digging into the edge of it.
- (2) In nine cases out of ten put the control line as close to the edge of the fire as possible.
- (3) If the heat of the fire or other conditions make it impracticable to work close to the edge of the fire, the control line should almost always be back-fired.
- (4) Hold every foot of completed control line if it takes the whole crew.

(5) In most cases attack the fire from the rear, working along the flanks toward the head. If necessary, part of the crew may be used to check the head of the fire.

(6) Put on sufficient men at the start.

(7) Organize the crew and put on plenty of straw bosses.

(8) In building control line, rest the whole crew at regular intervals, say five minutes in every half hour.

(9) Build the control line sufficiently wide and locate it so as to avoid bad windfalls. Throw all brush and logs away from the fire (with a few exceptions).

(10) Put the camp as close to the fire as convenient and safe. If there is no trail to the fire, send in an advance crew with man packs and put the rest of the crew to building trail until the main camp can be moved.

(11) Do not reduce the crew too soon after the control line is completed; put the men at work putting out fire inside the line.

(12) Do not leave a fire until it is out, and be very sure it is out. The last man should not leave for at least three days after the last spark is out. This is the most important rule of all.

ORGANIZATION ON FIRE LINE.

Work to be accomplished.

Fighting a forest fire resolves itself into the doing of the following things, for which the fire chief is responsible:

(1) Feeding and lodging the men in camp.

(2) Carrying food and water to the men on the control line.

(3) Keeping up the supply of food, equipment, and personal commissary by requisitions on the quartermaster.

(4) Keeping a proper distribution of tools to different parts of the control line.

(5) Keeping tools sharp.

(6) Keeping an accurate record of the time of the men and personal commissary or property charged.

(7) Maintaining discipline.

(8) Segregation of the men into crews or gangs, each with its proper directing force for (a) construction of control line, (b) day and night patrol of line, (c) finishing work on control line.

(9) Maintenance of adequate scout service for purpose of watching all parts of the fire.

(10) Maintenance of communication service, either by emergency wire or by messengers.

Extent of organization.

It is obvious that the number of assistants needed by the fire chief to accomplish these things will depend upon the complexity of each function, or, in other words, upon the character of the fire, its controllability, and the number of fire fighters employed. For a small fire with only 10 or 12 men employed, the fire chief, with the assistance of a cook and perhaps one straw boss, can do everything necessary. The length of the fight is also a factor. The same organization suggestion for a 10 or 12 man crew could undoubtedly handle 25 men if the fight only lasted one day. The extent of the division of duties and the size of the directing force must keep pace with the expansion in numbers and in difficulties encountered.

Scout service.

To properly direct the fight the fire chief requires current information concerning all that is taking place on the fire line. This includes not only the progress being made at different points on the control line, on different sides of the fire, and the difficulties encountered at each camp, but exactly what the fire is doing at every point, the topography and type of timber surrounding the fire, and ways and means of getting new camps established or taking other additional measures to stop the progress of the fire. On large fires this work will require the constant attention of one or more men. A forest officer familiar with the country, and one who understands using a pocket compass and making sketch maps, is very desirable for this work.

Inventory tools and supplies.

In order that the quartermaster may do his work most efficiently a current check of tools and supplies on hand and needed should be kept. A close check on the distribution of tools at all times will

make it possible to do the work with a minimum number of tools and will avoid handicapping the work through a wrong distribution. It should be remembered that the need for shovels will increase as the length of patrol increases.

Discipline.

In nearly every crew will be found some disorganizers, who disturb the equilibrium of a well-planned organization. As fast as spotted they should be discharged. Men who do not work willingly or do not faithfully try to stop the fire have no place on a crew. It is essential to be absolutely fair with the men, but the work is too expensive to permit the retention of any who do not give honest effort. Men who are discharged should be accompanied or followed by a reliable man to make sure no new fires are started either intentionally or carelessly. Camp rules and other instructions should be posted and strictly enforced.

Camps.

Keep the camp clean and see that the cook keeps clean. Make the cook responsible for getting meals on time and for the work of his subordinates; give him all the assistance he needs, and humor him so far as possible in all the whims and idiosyncracies common to most camp cooks.

Arrangement of camp.

The kitchen should be located preferably not nearer than 50 feet to the camp water supply; men's sleeping quarters should be about 100 feet from the kitchen, with the headquarters and commissary tents midway between. Tables should be built of poles or box boards for the use of the cook in the preparation of food and from which to serve it. Food will be served in "round up" or cafeteria style, the men forming in line and filing past the tables on which the prepared food is placed. The cook and his helpers will serve the food.

A garbage pit must be dug not nearer to the kitchen than 50 feet and at least 100 feet from the water supply. Cover the garbage with dirt daily and dig new pits as fast as needed.

A suitable latrine pit must be dug about 200 or 300 feet from the camp and all men required to use it. Cut a wide trail to this pit and post directing signs throughout the camps. Throw earth into the pit daily.

Camp rules.

The following are suggested as suitable camp rules to be posted in each camp:

(1) Commissary supplies will be issued by the timekeeper and charged to each man's account. The timekeeper is prohibited from accepting cash.

(2) Each man must report to the timekeeper upon arrival, and each day when leaving for or returning from work.

(3) Each man who receives bedding or other property will have same charged to him until the property is returned. If not returned, the value of it will be deducted from his pay.

(4) All disputes arising over time must be settled with the timekeeper or camp foreman before leaving camp. The paymaster has no authority to change time slips.

(5) Camp fires will not be allowed outside of area designated by camp foreman.

(6) Keep out of the camp kitchen except when called to meals.

(7) Firearms of any description will not be allowed in possession of the men. They may be checked with the timekeeper and returned to the owner when leaving camp.

(8) Gambling or the possession of intoxicating liquor is absolutely prohibited.

Camp foreman.

If more than one camp is necessary place each one in charge of a camp foreman. The camp foreman will be responsible for directing the work of the men assigned to his camp, both in camp and on the control line, subject, of course, to the general direction of the fire chief.

Timekeeper.

A timekeeper is usually needed for crews of 20 men or more. His duties are in reality those of camp manager under the direction of the camp foreman. He will be held responsible for the general management of the camp, for keeping time, for handling personal commissary, for ordering supplies, for checking tools, equipment, and property, and usually for maintenance of emergency wire telephone lines. If he has sufficient time, he should also make a record of the progress of the fight, the area burned over, and the cost of different classes of work undertaken.

Crew foreman.

Where more than one main crew is working from one camp, each division or crew should be in charge of a crew foreman. His duties will be the general direction of the work on the control line under the supervision of the camp foreman.

Straw bosses.

Straw bosses are needed for the more complete direction of the work. Small units of the crew—for example, the ax and saw gang, the mattock and shovel gang, and the patrolmen on one section of the control line—should be placed in charge of one member of the gang known as a straw boss. One straw boss should ordinarily have charge of not more than 10 men.

Total directing force.

The foregoing organization contemplates a total directing force of from 15 to 25 per cent of the total number of men employed. Considering the length of service, the character of the work, and the character of the men usually employed, an overhead force of 25 per cent is not too great.

Other special work.

The problem of getting lunch to the men working on the control line and of providing them with drinking water should receive careful attention. Men should be detailed from the crew for this work. Pack animals will be used if the grade permits. Drinking water for

men should be provided at frequent intervals. Men patrolling the line can carry their own lunch and ordinarily sufficient water to supply themselves. If the construction crew is working 12 hours a day, two lunches should be provided, one about 10 a. m. and another about 2.30 p. m.

Construction work.

The work of building a control line is generally organized about as follows: The crew foreman goes ahead and blazes out the line a few hundred feet at a time. The axmen follow, doing the swamping, cutting all small logs, brush, and small trees. The saw crew comes next, cutting the large logs and felling large trees. If the number of large logs justifies it, a peavey crew of two men follows the saws to roll out logs. If this work is not heavy the saw crew will roll out the logs. The mattock men follow making the trench. Generally one or two or more shovel men come behind cleaning out the trench. The tools should be so balanced that the axes and saws can keep well ahead of the mattock men, thus crowding them all the time to keep up. The crew foreman should shift the men so as to maintain this balance. If the axmen get temporarily ahead, and it is not practicable for lack of mattocks to put them on the mattock work, the width of the line swamped out should be increased in order to further strengthen the line. Avoid crowding; better results will be obtained if each man has plenty of room.

Sufficient extra tools should be brought out from the camp to the fire line to permit shifting the crews as needed. If more axes are required, one of the mattock or shovel men should be sent back for them to the point where the surplus tools were deposited. All tools left along the control line should be laid flat in the center of the trench where they can not be lost and are in no danger of burning.

Men fighting fires are usually working under great physical strain, and in order to get the full efficiency of a crew care should be taken not to overtax their strength. On fires requiring rapid work, a good plan is to work the men 25 minutes and rest them 5. In this way more may be asked and received of the crew. A talk to the men

telling them just what must be done to stop the fire at any point and asking them to put in a little extra work, will often give the needed incentive; men working with no end in view probably would not get the work done.

Communication.

Emergency wire in connection with portable telephone instruments should be used to connect the various fire camps, the base of supplies, and important points on the control line.

Communication kits, as listed in the Appendix, have been prepared and will be available on requisition at the district warehouses. These kits contain all the material needed for complete telephone communication. They will, of course, be needed only on the larger fires where the fight will last several days or weeks. The following rules will be useful in inaugurating and maintaining a communication system:

- (1) Hang the wire to branches or to notches cut into the bark of trees, high enough to keep it out of the way of animals.
- (2) Along pack trails keep the wire 10 feet or more from the trail.
- (3) In crossing a trail give the wire a clearance of about 12 feet. Fasten the wire by means of nails and tape, avoiding any direct contact between the nails and the wire.
- (4) Spans exceeding 50 feet must be avoided.
- (5) Constant patrol of the line to keep it in working order is essential.
- (6) Test each line for trouble at a regular time each morning.

FINANCES.

GENERAL POLICY.

Statement of problem.

Two questions of finances must eventually be solved. One is to determine for each Forest the total average annual expenditure necessary to secure efficient protection. The other is the proper balance in expenditures for prevention, detection, and control.

The first question can not be decided until accurate information is available for each Forest concerning (1) the total stand, value, and distribution of the timber, including young growth; (2) the fire risk to which the timber is subjected, expressed as average annual acreage or value burned over. If this annual loss is reasonable as compared to the value of resources and the protection standard adopted, it is clear that the annual expenditures for protection are sufficient. One of the objects of a fire survey is to find the answer to this question.

Policy patrol expenditures.

The balance between prevention, detection, and control is largely a question of public sentiment, of inflammability, and of controllability. In other words, it depends upon the extent to which the general public cooperates, the rapidity with which fires normally spread, and the accessibility of the Forest. The present policy in regard to prevention has already been stated. The condition of public sentiment seems to justify it. On fire patrol (mostly detection and first line of defense) it will be the policy to hold expenditures to the amount now annually allotted for this purpose. Further experience may demonstrate that this is not enough, but for the present all efforts should be directed toward increasing efficiency of the patrol force and in securing larger appropriations for the construction and maintenance of permanent improvements.

Policy fire-fighting expenditures.

The following policy will govern in deciding expenditures for fire fighting:

(1) Strict economy in fire fighting, as in all other work, is imperative.

(2) The best economy is to strike all fires hard in the beginning and get them out. Not more than 100 men should be put on one fire (or group of fires practically one) unless very sure that additional expenditure is in proportion to the risk and probable result of the effort. Resources at stake and risk involved must be thoroughly considered before expenditures are incurred.

Record of fire-fighting expenditures.

Every forest officer who incurs a liability for fire fighting must make a record of the actual or the probable amount involved and send a statement on the form provided immediately to the supervisor or quartermaster.

ACCOUNTS.**Forms.**

Fifteen new forms designed to meet the various requirements for handling and recording expenditures for fire fighting have been prepared. The full list and sample forms are given in the Appendix. Every forest officer must acquaint himself with the proper use of these forms.

Time keeping.

Rules for payment of fire fighters are fully covered in the labor contract form. These rules may be modified by the fire chief to meet unusual or unforeseen conditions. Such modifications should, if possible, be first approved by the district forester. In any case, variations must be slight and temporary only. Strict adherence to the rules, unless there is very good reason for variation, and fair treatment of fire fighters, will be insisted upon. A tally sheet and time book have been provided for keeping the time of men in camp. The identification card will give each man's time up to the time he reaches the first camp. When transfers are made between camps, each man's time will be made out on the time slip up to the time he leaves for the next camp. A statement should be made on the time slip indicating the amount of time, if any, which has been promised for travel to the next camp. The last time slip should give the travel time allowed to point where hired. If no travel time is allowed for reasons given in the time rules, a statement of the reasons should be entered in the time book and on the time slip. The daily tally sheets and the time book should be sent by the time-keeper to the supervisor at the close of the fire.

Meals and lodging.

If necessary to hold fire fighters in town, make arrangements with some boarding house or restaurant for meals and lodging. A contract form and meal and lodging tickets have been provided. Payment will be made on Form 5a vouchers.

Medicine and medical services.

The agricultural appropriation act for the fiscal year 1916 provides for the purchase "of medical supplies and services and other assistance necessary for the immediate relief of artisans, laborers, and other employees engaged in any hazardous work in the Forest Service." Under this act it is possible to buy medicine, pay doctor bills, and transportation charges for injured fire fighters. Such expenditures should be limited to those actually needed to give "immediate relief." This usually means the expenses incident to giving the injured fire fighter first-aid treatment and getting him to the nearest town.

Compensation for injury.

The compensation act provides for payment of wages (including the value of meals, if furnished in addition to wages) to men injured in Forest Service work. Immediate report of injury, and subsequent reports as provided in the special instructions covering the procedure in such cases, should be sent to the supervisor.

Payment of fire fighters.

The various means now employed to pay fire fighters are as follows:

(1) Certification of time on a pay roll, Form 2, and payment by the district fiscal agent by Government check.

(2) Use of personal funds by forest officers and reimbursement on Form 4 supported by Form 4a receipts.

(3) Payment by Government check by a forest officer authorized to act as temporary special disbursing agent.

(4) Cash payments by an authorized agent of the district fiscal agent.

Other means of payment may be found which are better adapted to payment of comparatively small sums. The district fiscal agent will keep supervisors currently informed of any changes in procedure.

Payment by pay roll.

Fire fighters usually demand cash. If men are employed who are local residents and are able to wait a few days, time can be certified on a pay roll and mailed to the district fiscal agent. Such pay rolls will be given precedence over all others. Not more than one day's time will ordinarily be required for auditing and preparation of checks.

Personal funds.

For comparatively small crews and in emergency the use of personal funds is the only available means of providing cash payments. Not more than \$200 should ordinarily be included in one reimbursement account. Wherever feasible, a pay roll should be submitted a few days before the men leave the fire. Part payment by Government check will then be ready when the men come out, which will reduce the amount to be covered from personal funds.

Special disbursing agents.

Forest clerks, deputy supervisors, or some other forest officers may be appointed temporary special disbursing agents or special deputy fiscal agents. This requires a bond and some additional clerical work, but it obviates all difficulties in payment of men. Up to the limit covered by the bond a temporary special disbursing agent or special deputy fiscal agent is authorized to pay cash or issue Government checks in payment for services of temporary laborers. Requests for such authority should be made if payment of men can not under normal conditions be handled by the first two methods.

Special paymasters.

Where the payment of fire fighters assumes proportions exceeding the authority of the forest force to handle, a disbursing officer will be sent by the district fiscal agent. Immediate call should be sent to the district forester whenever such assistance is needed.

Personal commissary.

Tobacco, articles of clothing, and other articles of a personal nature will be furnished fire fighters, and the cost deducted from their wages. Proper entries will be made on the time slips for the guidance of the paymaster. The officer acting as quartermaster (or the employing officer) will make purchases of such supplies on purchase orders, on which the articles will be listed in detail. An agreement will be made with the merchant to return any undamaged articles not used. After the men are paid off and undamaged goods returned to the merchants, Form 5a vouchers will be prepared in payment for the net amount of such supplies used. Form 939c will be sent to the property auditor in the usual way. The exact number or amount of each article purchased will be shown on these forms. The goods will be handled as nonexpendable property. They will be invoiced by the quartermaster, and all transfers to timekeepers will be covered by receipt. The unit price of each article will be given on the invoice. Goods remaining after final settlement may be condemned and sold, condemned and destroyed, or held in storage for future use. The regular instructions governing disposition of property no longer needed will be followed. Goods lost or stolen will be accounted for on Form 858.

Commissary prices.

Articles of personal commissary will be sold to fire fighters at actual cost to the Government at the place of sale.

Strict accounting.

Each fire fighter who receives personal commissary will receipt for it on the commissary order blank. This includes forest officers as well as temporary laborers; the former will afterwards settle with the quartermaster or directly with the merchant. After the fire, each timekeeper will turn over to the quartermaster the commissary order blanks for the goods sold, and will return the unsold goods. The quartermaster will receipt to the timekeeper for the goods returned and relieve him of the responsibility for those sold.

Final adjustment of commissary account.

From the commissary order blank receipts the quartermaster will prepare a list showing the number of each article sold, for which deductions have been made from the wages of the men. This statement supported by the receipts will be sent to the property auditor to be checked against Form 939c. Form 858 for any balance unaccounted for will clear the record. Totals only will be checked by the property auditor. It will be unnecessary to segregate the goods purchased from each merchant.

Deduct commissary from wages.

If payment is made by pay roll (methods 1, 3, and 4) deductions for commissary will be shown on the pay roll. In the column headed "Amount" will be given the net amounts due each man. The deductions will be given under "Remarks." If Form 4 reimbursement account (method 2) is used, show the net amount paid each man on Form 4 supported by Form 4a receipt on which will be shown the total amount due and the deductions for commissary. The fiscal agent is only interested in the total amount of the deductions, hence it will be unnecessary to show the list of articles on pay rolls and reimbursement accounts.

Property.

Careful invoice and receipts for nonexpendable property used in fire fighting will be insisted upon. The man who buys it or receives it from a warehouse must invoice it and secure a receipt for subsequent transfers. The quartermaster will finally check up the status of property after the fire. A reasonable percentage of loss will be expected. Fire fighters will be charged with bedding and other valuable property loaned to them, and if not returned (except for a valid reason) the value of it will be deducted from their wages in the same manner as for personal commissary.

Transportation accounts.

A definite agreement in advance should be made with every owner of transportation equipment hired. For pack animals a

contract form has been provided. For wagons and automobiles a memorandum of agreement or terms should be written out, one copy given the owner and the duplicate sent to the quartermaster or supervisor. Wagons and teams will ordinarily be hired at a rate per day, or a rate per pound. Automobiles will preferably be hired at a rate per mile, fixed with reference to the condition of roads. Freight and express will be made on the regular Government bills of lading.

REPORTS.

Importance.

One of the best preventive measures is to keep the public informed of fires burning and fires which have been extinguished. To do this, current up-to-date reports are needed. The reports also assist the supervisor, the district forester, and the Forester in keeping in touch with the situation and in taking action to strengthen the organization wherever it appears to be weakening. Prompt reports of every fire must be made by the forest officer who discovers it and by the man who puts it out. The report should not, of course, interfere with control operations. Each supervisor is required to submit a report by wire and by mail every 10 days—on the 10th, 20th, and last day of each month.

Essential points in report.

The most important facts to be included in the 10-day report are the cause, the location of each fire, and the status of control operations. The final report should show the elapsed time; that is, the time between the start and the discovery (where known), between discovery and report to the officer responsible for action, between report and the first work on the fire, and between the first work and the extinguishment of the fire.

Classification of causes.

The standard classification for reporting the causes of forest fires adopted by the Service is as follows:

Railroads.—Fires from sparks or cinders of all classes of locomotives and construction engines, and all other fires incidental to operations on, or to the occupancy of, the right of way of an established common

carrier railroad, or to railroad construction, or to clearing rights of way.

Campers.—Fires resulting in any manner from carelessness of campers, and travelers through the Forest, such as stockmen, prospectors, picnickers, surveyors, berry pickers, hunters, and fishermen.

Brush burning.—Fires caused by clearing lands for any purpose (other than for rights of way for common carrier railroads, and brush burning in lumbering operations) or by rubbish, garbage, range, stubble, or meadow burning, and by burning out animals, insects, or reptiles.

Lumbering.—Fires incidental to all lumbering operations, caused by sawmill engines, donkey engines, logging railroad locomotives (except on such logging railroads as are common carriers), and woods camps; through carelessness of employees engaged as wood choppers, brush burners, shake makers, etc., and by persons cutting free-use timber.

Lightning.—Fires directly or indirectly caused by lightning, regardless of locality of origin.

Incendiary.—All fires maliciously set, regardless of locality of origin.

Miscellaneous.—Fires resulting from burning buildings, prairie fires, sparks from chimneys and stacks, other than those classified under railroads and lumbering; blasting, unless more properly classified under brush burning, railroads, or lumbering; electric wires, unless accompanied by lightning; spontaneous combustion, either chemical or mechanical.

Unknown.—All fires the origin of which can not be determined in such degree of certainty as would justify their inclusion under any other head.

Damage.

The area of every fire should be at least roughly ascertained. In addition, it is necessary to secure an estimate of the damage. In figuring the money value of the merchantable timber or forage burned over, the market price per 1,000 board feet obtained in

timber sales, or the acreage value based on the grazing fees received, will be used. If the timber is inaccessible, the minimum stumpage price fixed by the Secretary will be used. For young growth (on land which will grow commercial timber, regardless of its accessibility), and for protection forest, use the figures given in the following table. The figures were obtained by:

(1) Assuming that, of the area burned over in different types, the following proportions must be artificially planted:

Type.	Proportion.
Lodgepole pine.....	$\frac{1}{5}$
Yellow pine, fir, and larch.....	$\frac{2}{5}$
White pine and other merchantable.....	$\frac{3}{5}$

(2) Assuming a planting cost of \$5 per acre.

(3) Assuming costs of protection and administration, by types as follows:

Type.	Cost per acre per year.
Lodgepole pine.....	2 cents
Yellow pine, fir, and larch.....	3 cents
White pine and other.....	4 cents

The method used in computing value per acre for young growth is that given in the Standard Instructions for the Determination of Fire Damage to Young Growth, pages 6 and 7. (See also Appendix.) The damage will be estimated in accordance with the per cent of area of young growth of each type burned over, using the figures in the following table:

Value per acre for young growth.

Type.	Age in years.			
	10	20	30	40
Lodgepole pine.....	\$1.57	\$2.34	\$3.38	\$4.77
Yellow pine, fir, and larch.....	3.03	4.42	6.28	8.79
White pine and other merchantable.....	4.49	6.49	9.18	12.80
Protection forests and unmerchantable species	Arbitrarily fixed at \$1 per acre for all ages.			

APPENDIX.

TERMS USED IN FIRE PROTECTION.

DISTRICT 1.

Accessibility.—Distance to any area from outside assistance, together with the available transportation facilities. The allotment of funds to any area for protection purposes depends upon its protection value and its accessibility.

Alidade.—An instrument used in determining the azimuth of fire from a given point.

Base, supply.—The point to which supplies are brought by wagon, auto, or other vehicles, and from which they are taken to the fire camps, usually by pack horses.

Board, fire map.—Board on which map containing azimuth circle is mounted and oriented when used to locate fires.

Boss, straw.—The boss of a gang forming part of a crew, such, for example, as the mattock gang, ax gang, one unit of the patrol force, etc.

Boy or buck, water.—The man whose duty is to keep the men working on the fire line supplied with drinking water.

Cabin, patrol.—A small cabin used as temporary quarters for patrolmen.

Camp, supply.—(See Base, supply.)

Camp, spike or side.—A temporary fire camp, usually a small one and often located at points where it is impracticable to take horses.

Circle, azimuth.—A circle, graduated in degrees, fixed on a map with its center at the point representing the position of the observer and with 0° and 360° due north of the occupied point.

Control.—The preparation for fire fighting in advance of actual fires, getting to the fires after they are reported, and controlling them or putting them out after they are reached. Control may be divided as follows: Preparation control, transportation control, and suppression control.

Control, under.—A fire that has been checked and in a condition that the work of actually putting it out can begin.

Controllability.—Factors affecting suppression control of any particular fire, e. g., physical features, length of dry weather, wind, temperature, stand, etc.

Control line.—The line from which the fight against the fire is made. Not to be confused with the actual edge of the fire.

Commissary.—All supplies for feeding, clothing, and comfort of fire fighters.

Commissary charge.—A charge entered in the timebook in a space provided for such entry, covering miscellaneous purchases not considered a part of the obligation of the employer to the laborer, value of which is to be deducted from his labor, such as clothing, shoes, etc.

Chasers, smoke.—The men stationed at central points whose duty it is to go immediately to fires reported by the patrol force.

Chief, fire.—The active head of the fire fighting on any particular fire or portion of a fire. The man who plans and directs the fight and develops the organization.

Chief, assistant fire.—Fire chief's assistant on a big fire. His duty is to assist in planning and directing the fight and particularly to look after the administrative details.

Clerk, commissary.—Quartermaster's clerical assistant.

Clerk, property.—Assistant in the storehouse who fills orders approved by the quartermaster.

Cook.—The head of the kitchen crew.

Cook, assistant.—The cook's skilled helper.

Cook, bull.—The cook's helper assigned to the task of getting wood and water and other odd jobs.

Detection.—The finding and reporting of fires.

Emergency, fire.—Any time during the fire season that an uncontrolled fire, regardless of size, exists within or near a National Forest.

Extinguished, or out.—A condition existing when no sign of smoke can be detected anywhere on the burned area for a period of three days; it rarely exists except after a rain.

Equipment.—The general name for any paraphernalia used in fire protection.

Equipment, bed.—Any equipment pertaining to sleeping accommodations.

Equipment, camp.—Any equipment pertaining to camp use other than that used in preparation of food.

Equipment, fire fighting.—Any tools or instruments used in fire fighting.

Equipment, kitchen.—Any equipment used in the preparation of food.

Equipment, mess.—Any equipment pertaining to the serving of food after it is prepared.

Equipment, pack.—A general term designating the paraphernalia used in any form of pack transportation.

Fire, surprise.—A controlled fire set without the knowledge of the patrol force for the purpose of testing the efficiency of the detection organization.

Fire, test.—A controlled fire set with the knowledge of the patrol force for the purpose of testing the efficiency of a lookout point, a patrol beat, or other vantage point on which a patrolman is placed.

Firing, back.—Starting fires ahead of the main fire with the object of making a wide fire line. Always started from a road, trail, or previously constructed trench from which the direction of the back fire can be controlled.

Fire line.—The territory covered or immediately adjacent to the scene of operation on any fire or fires. Frequently used to mean the control line.

Finance.—The securing, allotting, and final use of cash resources.

Flunkey.—The cook's unskilled helper. His duty is to wash dishes, prepare vegetables, etc.

Foreman, camp.—The man in general charge of one camp, who directs all the operations of the men in that camp, subject to the general directions of the fire chief.

Foreman, crew.—The leader of a crew, either on construction or patrol.

Front, fire or fire head.—That part of the fire which is advancing most rapidly.

"Fuzzy stuff."—Any mossy or other highly inflammable under-growth.

Guard, per diem.—A resident in or near a Forest under contract to report and fight fires at an agreed rate per day.

Haze.—A general term applied to atmospheric conditions which reduce range of vision.

Head, fire.—(See Front, fire.)

Inflammability.—The combustible character of the ground and forest cover as indicated by the rapidity with which fires normally spread during the dry season. (See Risk.)

Liability.—Amount or value of destructible resources endangered by forest fires.

Line, fire.—(See Fire line.)

Line, control.—(See Control line.)

List, ration.—A list of supplies in the form of a table showing the amounts and weights of food stuff required for any number of men for a specified number of days.

Lookout, permanent.—A peak or tower on which a watchman is maintained constantly throughout the fire season.

Lookout, temporary.—A peak or tower on which a watchman is maintained only a part of the day or only for a portion of the fire season.

Man, lookout.—Man stationed on a mountain top or other prominent place to watch for fires.

Map, fire.—Any map used to show graphically any data, plans, or problems related to fire protection.

Observatory, fire.—A cabin located on the extreme top of a mountain, designated with especial reference to wide field of vision.

Packer.—In general any man who travels with and as a part of a pack-train complement.

Packer, head.—The packer who is responsible for the goods handled by a certain train, the condition of the horses in the train, the condition of the property in use, and the time made by the train for which he is head packer.

Pack master.—Man at main supply camp who inspects weights carried, provides feed for horses, routes trains, divides trains when division becomes necessary.

Pack, emergency.—A pack kept always ready at a convenient place for use on a small fire; may be either man packs or horse packs. Emergency packs are usually made up of tools, food supplies, and cooking outfits.

Paymaster.—Fiscal agent who issues checks or pays cash to the fire fighters.

Patrol.—Any systematic plan put into effect for the detection and control of fires.

Patrol, primary. (Heretofore known as "fixed patrol" or "fixed risk patrol.")—Patrol where the sources of fire danger are fairly well fixed or located from previous experience, e. g., along railroads, or streams visited by a large number of campers.

Patrol, secondary. (Heretofore known as "blanket patrol.")—Patrol on areas where even the approximate location of fires can not be foretold and therefore necessary to give every part of the area equal attention. The best example is a lookout watchman.

Period, patrol.—Time from control of a fire to the time of next general rain or until extinguished.

Poster, fire.—A placard asking the help of the public in fire prevention, giving warning of danger and liability involved in starting fire.

Point, supply.—Source from which supplies are purchased or labor is obtained. Usually a town located nearest the fire.

Prevention.—Elimination or reduction of the sources or causes of fire.

Profile, Koch.—A series of diagrammatic cross sections through the country included in the range of vision of a lookout, made for the purpose of studying the "seen" and "unseen" areas and comparing mathematically the range of vision of different points. First suggested by Elers Koch.

Publicity work.—Any means of educating or interesting the public in the prevention, detection, and control of forest fires.

Quartermaster.—The man in charge of the work of getting in men, supplies, and equipment. Headquarters usually at the supply camp. The quartermaster is usually independent of the fire chief, especially where he is supplying more than one fire.

Quartermaster, assistant.—Administrative assistant to the quartermaster.

Ration.—Food supply sufficient for one man for one day.

Rigging, pack.—Pack equipage; the saddle blankets; cinch, cargo, and sling ropes; alforjas, mantas, pack covers, etc., necessary to properly furnish one horse. This varies with the style of saddle, packing, and goods to be handled.

Risk.—Probability of fires starting, together with the rapidity with which they normally spread during the dry season. It is the source or origin and the inflammability.

Route, or beat, patrol.—Line of travel followed by movable patrol.

Rules, time.—A set of concise specific rules which cover employment of all classes of labor.

Scout.—A man who is detailed to the work of watching the progress of the fire and reporting any changes in behavior, dangerous points, favorable points of attack, etc.

Season, fire.—Period during which climatic conditions are such that there is danger of destructive forest fires.

Season, normal fire.—A season during which weather conditions are normal or average.

Season, emergency fire.—A season during which weather conditions are more unfavorable than the average, and the number and size of fires requires the close supervision of more men than provided by the regular protective force.

Smoke, drift.—The shifting of smoke that arises from a fire below the line of sight from a lookout or patrol route.

Smoke, drifted in.—Smoke drifted in from another region or district.

"Swinging logs."—Changing the position of logs on a hillside so as to prevent them from rolling across the fire trench.

Timekeeper.—The man who keeps a record of the time of each fire fighter, and does other clerical work incidental to a fire camp.

Train pack.—A string of horses with head packer, packers, and full equipage for all horses.

Trench or trail, fire.—That portion of the fire line from which the duff, rotten wood, and roots are removed, exposing the mineral soil.

Tower, lookout.—A platform or small house elevated so as to place it above nearby objects which limit the field of vision.

Value, protection.—Value of destructible resources, together with the risk to which they are subject. If it could be so expressed, it would be the product of the liability multiplied by the risk.

Vision, range of.—Territory that can be seen from a lookout station or patrol beat.

Vision, maximum effective.—The maximum territory which can be seen from a lookout point with sufficient clearness and certainty under normal fire conditions to make sure that every fire can be reported in its early stages.

Warden, fire.—An officer empowered by the State or other organization to take action to control forest fires. A title which applies particularly to State and fire association guards.

IDAHO FIRE LAWS.

Act of March 15, 1909, repeals sec. 1612 and amends secs. 1604, 1605, 1607, 1609, and 1610, Code of 1907 (p. 227 Laws 1909). Sec. 1607 as amended, further amended by act February 14, 1911 (p. 341 Laws 1911).

Be it enacted by the Legislature of the State of Idaho:

SECTION 1. That section 1604, chapter 4 of title 9 of the Political Code of the State of Idaho be amended to read as follows:

“SEC. 1604. The State board of land commissioners of the State of Idaho shall divide the State into districts to be known and designated as fire districts, having due regard in establishing the boundaries thereof to the area of forests or timber lands therein; they shall appoint, upon the application of any owner or owners of land or other property within the State, one fire warden within each of the districts of the State, and such fire wardens, so appointed, shall be paid by said property owners applying for the appointment of the same, and shall in no case be paid by the State, except as hereinafter provided. All such appointments shall be made for one year, unless sooner revoked, and the State board of land commissioners may at any time revoke any such appointment, upon good cause shown. The fire wardens, so appointed, shall appoint as deputy fire wardens, within their respective districts, such persons as shall be designated by such owners of land or other property, who shall also be paid by the person or persons securing their appointment. Their employment shall not be for any definite time, and they shall be discharged immediately by the fire warden of their district upon the request of such person or persons at whose instance they were appointed. The fire warden and deputy fire wardens shall have and exercise police powers while engaged in performing the duties of their respective offices: *Provided*, That the State board of land commissioners shall prepare an abstract of the penal laws relating to forest and prairie fires, together with proper regulations and suggestions for the prevention and control thereof, and before April first in each year shall forward printed copies to all fire wardens, railroad companies, and chairmen of county boards. The wardens shall post such abstract in numerous conspicuous places in their respective districts.”

SEC. 2. That section 1605, chapter 4 of title 9 of the Political Code of the State of Idaho be amended to read as follows:

"SEC. 1605. The fire warden shall enforce the provisions of this act. They, and the deputy fire wardens shall patrol their districts in dry seasons. They shall promptly investigate each prairie and forest fire within their respective districts. Each fire warden shall make an annual report to the State board of land commissioners of the fires within his respective district, together with the cause thereof, the property destroyed and its value, the lives lost, if any, and the means used to combat such fire, and any additional facts required by the State board. Each warden shall cooperate with the warden in the adjoining district, and, in his absence, assume control therein. Each may arrest, without warrant, any person found violating any provisions of this act, and take him before a magistrate and there make complaint; and, when a warden shall have information that such violation has been committed, he shall make similar complaint. Wardens shall go to the place of danger to control or prevent fires, and, in emergencies, may employ or compel assistance, and the compensation for such service compelled shall not exceed two dollars and fifty cents (\$2.50) per day, exclusive of subsistence and reasonable traveling expenses."

SEC. 3. Any person, firm, or corporation engaged in the cutting and removing of timber, logs, ties, telegraph poles, wood, or other forest products from lands within the State of Idaho, shall pile and burn or otherwise dispose of the brush, limbs, tops, and other waste material incident to such cutting, which are four inches or under in diameter, and the times and methods of so doing shall be prescribed by the warden of the fire districts in which said cutting shall be done. Any person, firm, or corporation violating the provisions of this act or refusing to conform to any rules made by the warden of any fire district of the State of Idaho relative to the time, place, and manner of burning or disposing of brush, limbs, tops, and other waste material incident to the cutting of timber, logs, ties, telegraph poles, wood, or other products, shall be guilty of a misdemeanor and upon conviction thereof be subject to a fine of not less than one hundred (\$100) dollars nor more than five hundred (\$500) dollars, or be imprisoned in the county jail of the county in which the offense occurs, for not less than thirty days and not to exceed six months, or be subjected to both such fine and imprisonment.

SECTION 1. Section 1607 of the Revised Codes of Idaho is hereby amended to read as follows:

"SEC. 1607. It shall be unlawful for any person, firm, or corporation to use any spark emitting locomotive, logging engine, portable

engine, traction engine, or stationary engine located in a timber district, without the use of a good and efficient spark arrester. Any person, firm, or corporation who shall fail to provide and use such spark arrester upon any engine, shall be guilty of a misdemeanor and upon conviction thereof shall pay a fine of not less than twenty-five dollars (\$25) nor more than one hundred dollars (\$100) for each day that such engine or locomotive is so used.

"(Approved Feb. 14, 1911.)"

SEC. 5. The period from June first to October the first in each year shall be known as the closed season, during which time it shall be unlawful for any camper, farmer, logger, or other individual, firm, or corporation to set out or cause to be set out, fires in slashings, down or fallen timber, or on timber lands or in the vicinity of grain fields, for the purpose of clearing land of brush, grass, or other inflammable material without first obtaining a permit in writing, or print, from the fire warden of the district as provided in section 3 of this act, and at no time shall any fire be set out when the wind is blowing to such an extent as to cause danger of the same getting beyond the control of the person setting out such fire, or without sufficient help present to control the same; and the same shall be watched by the person setting the fire until the same is out. Any person violating any of the provisions of this section shall be punished by a fine of not less than one hundred (\$100) dollars, nor more than three hundred (\$300) dollars, or by imprisonment in the county jail not less than one month nor more than six months: *Provided*, That this section shall not apply to any person or persons setting out back fires for the purpose of stopping or checking a fire then burning. The fire warden shall keep a complete copy of permits issued.

SEC. 6. That section 1610, chapter 4 of title 9 of the Political Code of the State of Idaho, be amended to read as follows:

"SEC. 1610. Every person, firm, or corporation operating a railroad shall keep the ground for fifty feet on each side of the center of the track, or such portion thereof as may be owned or controlled by such person, firm, or corporation, clear of combustible materials, except ties and other materials necessary for the maintenance and operation of the road, from June first to October first of each year. No person, firm, or corporation shall permit any of his or its employees to leave a deposit of fire, live coals, or ashes in the immediate vicinity of woodland or lands liable to be overrun by fire, and every engineer, conductor, trainman, or section man discovering fire adjacent to the track shall report the same promptly at the first telegraph or telephone station reached by him. At the beginning of the close season

every such person, firm, or corporation shall give his or its employees particular instruction for the prevention and extinguishment of fires, and shall cause warning placards to be conspicuously posted at every station within this State, and when a fire occurs near the line of his or its road, shall concentrate such help and adopt such measures as shall be available for its extinguishment. Any person, firm, or corporation violating any provisions of this section shall be guilty of a misdemeanor and shall be subjected to a penalty of not more than one hundred (\$100) dollars for each offense, and any railroad employee violating the same shall be guilty of a misdemeanor and shall be punished by a fine of not less than five (\$5) dollars nor more than fifty (\$50) dollars."

Code of 1907:

SEC. 1606. It shall be the duty of the fire warden of each fire district to issue written or printed permits during permit season to any and all persons named in an application to set out fires. Said application shall state the general description of the land upon which it is desired to set out fires and the extent of the slashing or burning desired to be burned. Said permit season shall be from June first to October first of each year. Said permit shall fix the time for setting out fires on any three consecutive days therein named, and not less than ten days from the date of such permit, and such fires shall be set at no time when the wind is blowing to such an extent as to cause danger of the same getting beyond the control of the person setting out said fire, or without sufficient help present to control the same, and the said fire shall be watched by the person setting out the fire until the same is out. Upon granting said permit the fire warden shall be present at said proposed burning, or notify, at the earliest possible moment, some qualified and acting deputy fire warden in the vicinity of said proposed burning to be present thereat, and upon good cause may revoke or postpone said permit upon notice to said applicant.

SEC. 1608. Every warden or deputy warden, and every person lawfully commanded to assist in enforcing any of the provisions of this chapter, who shall unjustifiably refuse or neglect to perform his duty; every person who shall kindle a fire on or near to forest or prairie land and leave it unextinguished, or be a party thereto; every person who shall use other than incombustible wads for firearms, or carry a naked torch, fire brand, or exposed light in or near to forest land; and every person who shall deface, destroy, or remove any abstract or notice posted under this chapter, shall be guilty of a mis-

demeanor, and upon conviction thereof shall be punished by a fine of not less than ten dollars nor more than one hundred dollars.

SEC. 6921. Any person who shall wilfully or carelessly set on fire, or cause to be set on fire, any timber or prairie lands in this State, thereby destroying the timber, grass, or grain on such lands, or any person who shall build a camp fire in any woods, or on any prairie, or any railway company which shall permit any fire to spread from its right of way to the adjoining lands, is guilty of a misdemeanor.

SEC. 7195. For the purpose of protecting the wild game of the State it is absolutely necessary to protect the forests of the State from the ravages of fire, and it is hereby made unlawful and a misdemeanor for any person or persons to willfully or maliciously set on fire, or cause to be set on fire, any timber, underbrush, or grass upon the public domain, in this State, or leave or suffer fire to burn unattended near any timber whereby such timber is set on fire, and upon conviction thereof the offender shall be punished by fine not exceeding three hundred dollars, or imprisonment in the county jail for a period not exceeding six months, or by both such fine and imprisonment.

FEDERAL FIRE LAWS.

Criminal Code of March 4, 1909 (36 Stat., 1088, 1098, and 1099).

SEC. 52. Whoever shall willfully set on fire, or cause to be set on fire, any timber, underbrush, or grass upon the public domain, or shall leave or suffer fire to burn unattended near any timber or other inflammable material, shall be fined not more than five thousand dollars, or imprisoned not more than two years, or both.

SEC. 53. Whoever shall build a fire in or near any forest, timber, or other inflammable material upon the public domain, or upon any Indian reservation, or lands belonging to or occupied by any tribe of Indians under the authority of the United States, or upon any Indian allotment while the title to the same shall be held in trust by the Government, or while the same shall remain inalienable by the allottee without the consent of the United States, shall before leaving said fire, totally extinguish the same; and whoever shall fail to do so shall be fined not more than one thousand dollars, or imprisoned not more than one year, or both. (As amended by act June 25, 1910, 36 Stat., 855, 857.)

MONTANA FIRE LAWS.

Act of March 4, 1909 (Laws of 1909, pp. 293-296).

SEC. 10. The State forester shall, under the direction and control of the State board of land commissioners, * * * have charge of all fire wardens of the State, and direct and aid them in their duties; direct the protection and improvement of State parks and forests; take such action as is authorized by law to prevent and extinguish forest, brush, and grass fires; enforce the laws pertaining to forest and brush covered lands, and prosecute for any violation of such laws. * * * He shall furnish notices, printed in large letters on cloth, calling attention to the danger from forest fires, and to the forest fire and trespass laws and their penalties. Such notices shall be posted by the fire wardens in conspicuous places in the several counties of the State, and particularly in brush and forest covered country, at frequent intervals along streams and lakes frequented by tourists, hunters and fishermen, at established camping sites and in every post office in the forested region.

SEC. 11. The State forester shall appoint in such number and localities as he deems wise, public-spirited citizens to act as volunteer fire wardens. Every sheriff, under sheriff, deputy sheriff, game warden and deputy game warden, shall be ex officio a fire warden * * *. The supervisors and rangers of the Federal forest reserves within this State, whenever they formally accept the duties and responsibilities of fire wardens, may be appointed volunteer fire wardens, and shall have all the powers given to fire wardens by this act. The fire wardens shall promptly report all fires to the State board of forestry, take immediate and active steps toward their extinguishment; report any violation of forest laws; and assist in apprehending and convicting offenders.

SEC. 12. The State forester and all fire wardens shall have the power of peace officers to make arrests without warrants for violations, in their presence, of any State or Federal forest laws, and no fire warden shall be liable for civil action for trespass committed in the discharge of his duties. Any fire warden who has information which shows with reasonable certainty that any person has violated any provision of such forest laws shall immediately take action against the offender by making complaint before the proper magistrate or by information to the proper county attorney, and shall obtain all possible evidence pertaining thereto. Failure on the part of any paid fire warden to comply with the duties prescribed

in this act shall be a misdemeanor and punishable by a fine of not less than twenty dollars nor more than one thousand dollars, or imprisonment in the county jail for not less than ten days nor more than twelve months, or by both such fine and imprisonment; and upon his conviction the district court wherein he is convicted shall forthwith declare his office vacant and notify the proper appointing power thereof.

SEC. 13. All fire wardens shall have authority to call upon any able-bodied citizens between the ages of eighteen and fifty years, resident in the vicinity, for assistance in putting out fires, and any such person who refuses to obey such summons, except for good and sufficient reasons, is guilty of a misdemeanor, and upon conviction, shall be fined in a sum not less than fifteen nor more than fifty dollars, or imprisonment in the county jail not less than one nor more than thirty days, or both such fine and imprisonment: *Provided*, That no citizen shall be called upon to fight fire a total of more than five days in one year.

SEC. 14. The State forester, assistant forester, and all fire wardens (except volunteer wardens), under such rules and regulations as the State board of land commissioners may provide, shall protect the timber of the State, and especially the timber owned by the State, from destruction by fire, and for such purpose, in emergencies, may employ men and incur other expenses when necessary: *Provided*, That no fire warden shall incur any expense in excess of fifty dollars without express authority of the State board of land commissioners.

SEC. 16. Any person who shall destroy, deface, remove, or disfigure any sign, post, or warning notice posted under the provisions of this act shall be guilty of a misdemeanor and punishable upon conviction by a fine of not less than fifteen dollars and not more than two hundred and fifty dollars, or imprisonment in the county jail for a period of not less than ten days nor more than three months, or by both such fine and imprisonment.

Code of 1907:

4360. *Fire guards.*—That every railroad corporation operating its lines of road or any part thereof within this State shall, between the fifteenth day of April and the first day of July in the year 1903 and each succeeding year thereafter, plow in a good and workmanlike manner, covering the sod well, upon each side of its line of road wherever it passes through a range or grazing country, a continuous strip of not less than six feet in width on each side of its track, as a

fire guard, which said strip shall, as near as practicable, run parallel with the line or lines of said railroad, and, in addition to said plowing, said railroad company shall cause to be burned between the fifteenth day of July and the fifteenth day of September of each year all the grass and vegetation between the said plowed strips and a line of fifty(50) feet inside said plowed strips: *Provided*, That such fire guard so plowed and burned need not be constructed within the limits of any town, village, or city, nor in private fields under cultivation, nor along the line of such railroad whenever the same runs through the mountains, or elsewhere where such plowing or burning would be impracticable: *And provided further*, That said fire guard, or portion thereof, need not be plowed or burned on or through any land which may be released from the operation of this act by the board of county commissioners of the county wherein such land is situated by their written certificate of release filed in the office of the county clerk of the said county: *Provided further*, That said plowing be not less than three hundred (300) feet from the center of the railroad track on each side of same, except in cases of cultivated fields, and then such plowing and burning shall be done closer to such railroad, but not less than seventy feet from the center of the track. (Act approved Mar. 5, 1903, sec. 1; 8th sess., chap. 63.)

4361. *County commissioners may plow guard and recover expense.*—That if any railroad company fails to comply with any of the provisions of section 1 of this act the board of county commissioners of the county wherein such violation occurs shall cause the neglected plowing or burning or both therein provided for, to be done, and may in a suit to be brought in their name, as said board, in the district court having jurisdiction, recover double the amount of the cost of such plowing or burning or both, with reasonable attorney fees to be fixed by the court, and such railroad company shall be liable further for all damages caused by its failure to comply with this act. (Act approved Mar. 5, sec. 2.) (8th sess., chap. 63.)

8768. (Sec. 1071.) *Setting fire to timber, etc., negligently.*—Every person who carelessly sets fire to any timber, woodland, or grant, except for useful or necessary purposes, or who at any time makes a camp fire, or lights a fire for any purposes whatever without taking sufficient steps to secure the same from spreading from the immediate locality where it is used, or fails to extinguish such fire before leaving it, is punishable by imprisonment in the county jail not exceeding one year, or by fine not exceeding two thousand dollars, or both.

8769. (Sec. 1072.) *Setting fires to timber, etc., maliciously.*—Every person who wantonly or designedly sets fire to any timber,

woodland, or grass, or maliciously fails to extinguish a fire after making the same for a necessary purpose, before leaving it, is punishable by imprisonment in the State prison not exceeding five years, or by fine not exceeding five thousand dollars, or both.

ARRESTS.

SAMPLE COMPLAINT.

UNITED STATES OF AMERICA.

NORTHERN DISTRICT OF CALIFORNIA,
City and County of San Francisco.

Before me, H. M. Wright, a United States commissioner for the northern district of California, at San Francisco, personally appeared this day John Doe, who being first duly sworn, deposes and says: That in the State and northern district of California, on or about the 8th day of July, 1911,

RICHARD ROE

in violation of section 52 of the Criminal Code of the United States, and within the jurisdiction of this honorable court, did then and there willfully, unlawfully, and knowingly set on fire and cause to be set on fire timber, underbrush, and grass upon the public domain of the United States of America within the limits of the Plumas National Forest whereby he did burn and destroy large quantities of timber, underbrush, and grass covering large portions of the Plumas National Forest.

Against the peace and dignity of the United States of America and contrary to the form of the statute of the said United States of America in such case made and provided.

Subscribed and sworn to before me this day of

.....
Commissioner aforesaid.

SAMPLE WARRANT.

The President of the United States of America to the marshal and deputy marshal of the central district of Idaho greeting:

Whereas complaint upon oath has this day been made before me by, charging and alleging that, late of, in said

district, heretofore, to wit, on day of, at the district aforesaid.....
contrary to the act of Congress in such case made and provided, which complaint is hereto attached; you are therefore hereby commanded that you shall take the said....., if he shall be found within your district, and him safely keep, so that you may bring him before me, the United States commissioner for the central district of Idaho, under and by virtue of the several acts of Congress in such case made and provided, at my office in....., in said district, to be dealt with according to law.

Witness my hand and seal this.....day of....., in the year of our Lord one thousand nine hundred and.....

U. S. Commissioner for Central District of Idaho.

SAMPLE MITTIMUS.

UNITED STATES OF AMERICA.

....., DISTRICT OF.....,
.....Division, ss.

The President of the United States of America to the marshal of the.....district of....., and to the keeper of the jail of....., in the State of....., greeting:

Whereasha been arrested upon the oath of.....for having, on or about the.....day of....., 1911, in said district, in violation of section.....of the Revised Statutes of the United States, unlawfully.....

.....
And after an examination being this day had by me, it appearing to me that said offense had been committed, and probable cause being shown to believe said.....committed said offense as charged, I have directed that said.....to be held to bail in the sum of \$....., to appear at the first day of the next term of the.....court of the United States for the.....district of.....division at.....and from time to time thereafter to which the case may be continued, and he having failed to give the required bail:

Now these are therefore, in the name and by the authority aforesaid, to command you, the said marshal, to commit the said.....to the custody of the keeper of said jail of.....and to leave with said

jailor a certified copy of this writ; and to command you, the keeper of said jail of said county, to receive the said....., prisoner of the United States of America, into your custody, in said jail, and him there safely to keep until he be discharged by due course of law.

In witness whereof I have hereto set my hand and seal at my office in said district, this....day of....., A. D. 19...

[SEAL.]

United States Commissioner for said
District of Division.

RETURN.

Received this mittimus with the within-named prisoner on the day of, A. D. 19.., and on the same day I committed the said prisoner to the custody of the jail keeper named in said mittimus, with whom I left at the same time a certified copy of the mittimus.

Dated, 19...

United States Marshal, District of

SAMPLE SUBPOENA.

UNITED STATES OF AMERICA.

..... District of, ss:

The President of the United States of America, to the marshal of
the district of, Greeting:
You are hereby commanded to summon.....

if be found in your bailiwick, to be and appear before me, a United States commissioner for the district of aforesaid, at my office on the day of 19.., at o'clock .. m., to give testimony, and the truth to say, in a cause pending before me, wherein the United States is complainant and defendant.

In behalf of

Hereof fail not, under the penalty of the law, and have you then
and there this writ.

Given under my hand, this day of A. D. 19....

United States Commissioner as aforesaid.

CONTENTS OF EMERGENCY COMMUNICATION KITS.

1-A kit will contain—

- 1 ring down portable telephone.
- 1 extra dry battery (No. 703 Everready tungsten).
- 2 half-pound rolls of tape.
- $\frac{1}{2}$ pound 8d. wire nails.
- 1 small screw driver.
- 1 pair 6-inch pliers, side cutting.
- 1 portable ground rod.
- 1 pay-out and take-up reel.
- 6 spools (3 miles) No. 20 gauge emergency wire.

1-B kit will contain—

- 1 ring down portable telephone.
- 1 extra dry battery (No. 703 Everready tungsten).
- 1 portable ground rod.
- 6 spools (3 miles) No. 20 gauge emergency wire.
- 1 howler mounted on backboard with condenser and two binding posts.

1-A and 1-B kits will be used from permanent telephone lines and the main fire camp.

The second type of emergency-communication kit will be known as 1-X and 1-Y.

1-X kit will contain—

- 1 Adams portable telephone.
- 1 extra dry battery (No. 705 Everready tungsten).
- 2 half-pound rolls of tape.
- $\frac{1}{2}$ pound of 8d. wire nails.
- 1 small screw driver.
- 1 pair 6-inch pliers, side cutting.
- 1 portable ground rod.
- 1 pay-out and take-up reel.
- 6 spools (3 miles) No. 20 gauge emergency wire.
- 1 howler mounted on backboard with condenser and two binding posts.

1-Y kit will contain—

- 1 Adams pocket portable telephone.
- 1 extra dry battery (No. 705 Everready tungsten).
- 6 spools (3 miles) No. 20 gauge emergency wire.
- 1 howler mounted on backboard with condenser and two binding posts.
- 1 portable ground rod.

INTERNATIONAL CODE.

Heliograph.	Wigwag.	Heliograph.	Wigwag.
A . —	12	N — .	21
B — . . .	2111	O — — —	222
C — . — .	2121	P . — — .	1221
D — . .	211	Q — — . —	2212
E .	1	R . — .	121
F . . — .	1121	S . . .	111
G — — .	221	T —	2
H	1111	U . . —	112
I ..	11	V . . . —	1112
J . — — —	1222	W . — —	122
K — . —	212	X — . . —	2112
L . — . .	1211	Y — . — —	2122
M — —	22	Z — — . .	2211

Heliograph.	Wigwag.
End of word	Hesitate. 3
End of sentence	. . — . . 33
End of message	. . — — . . . 333
Acknowledgment, or I understand	O(— — —) K(— . —) 22 22 3
Repeat last word	R(. — .) R(. — .) 121 121 33
Repeat last message	R . . . R . . . R . . . 121 121 121 333
Wait a moment	• . . . — — — 1111 3
Signal faster	— — — . — — — 2212 3
Cease signaling	• — — — 22 22 22 333

ABBREVIATIONS.

A =After	R =Are	Wi=With	North =N
B =Before	T =The	Y =Yes	South =S
C =Can	U =You	F =Fire	East =E
H =Have	Ur=Your		West =W

Starting to send a message: Just as you start to send a message after adjustment has been made, send a period two dots two dashes two dots. Receiving station will then know that the regular message is about to start.

CLASSIFICATION OF FIRES.

Class A.—Small fires which burn not more than one-fourth acre.

Class B.—Fires which burn over more than one-fourth acre but not more than 10 acres.

Class C.—Fires which burn over more than 10 acres.

Class C fires are divided further into:

Class C-1.—Fires that inflict damage amounting to less than \$100.

Class C-2.—Fires that do more than \$100 worth of damage but less than \$1,000.

Class C-3.—Fires that inflict damage to an amount greater than \$1,000.

FORMULA FOR COMPUTING VALUE OF FIRE-KILLED REPRODUCTION; COST OF REPLACEMENT METHOD.

$$R = C \times 1.0pm + \frac{e}{.0p} (1.0pm - 1), \text{ where}$$

R=Cost of replacement or value per acre for any given type.

C=Cost of blanting or seeding; \$5 per acre, which does not include cost of replanting fail spaces.

p=Rate of interest, 3 per cent.

m=Number of years necessary to replace the stand.

e=Annual expenses for protection and administration per acre per year; 2 cents for lodgepole type; 3 cents for yellow pine, fir, and larch; 4 cents for white pine, etc.

COST OF FIRE LINE CONSTRUCTION.

Conditions.

Where the timber runs from 5,000 to 10,000 feet per acre, moderately open, such as larch-fir type or open stand of lodgepole line, with easy slopes, scanty underbrush, soil with few rock, a crew of 50 men properly organized can clear a mile of control line of all inflammable material 50 feet wide and dig a trench 3 feet in width to mineral soil in a 12-hour day.

In rocky, rough country with shallow soil, where control lines must be constructed up steep inclines and in heavily timbered brushy

bottoms with much windfall, this work must necessarily go slower and the cost per mile increase in proportion.

Cost figures taken from actual control-line construction show that under the conditions as outlined above the lines should cost between \$250 and \$500 per mile.

Placing the average expense per man per day at from \$5 to \$8, according to accessibility of the fire, and an average of 1 mile of construction per day per 50-man crew, would make the cost from \$250 to \$400 per mile. If the average construction falls to half mile of line per day, cost naturally increases to from \$500 to \$800 per mile.

CREW.

Results of efficient organization.

One foreman, 2 straw bosses, 12 axmen, 4 sawyers, 22 mattock men, 4 shovel men, and 1 tool grinder. Total, 46 men. Organization only fair; men working too close together. Supervision poor. Distance to walk to fire, 50 chains. Cost of 1 mile of line, \$282.

Crew reduced to 1 foreman, 3 straw bosses, 6 axmen, 4 sawyers, 10 mattock men, 2 shovel men, and 1 tool grinder. Total, 27 men.

Well organized, men properly distributed, little lost motion. Worked 55 minutes, rested 5 minutes. Cost of 1 mile of line, \$184. Reduction in cost of work, 35 per cent.

Crew: 1 foreman, 3 straw bosses, 4 axmen, 2 sawyers, 8 mattock men, 1 shovel man, 1 tool grinder. Total, 20 men. This was a picked crew of seasoned men, well organized, close supervision, worked 25 minutes and rested 5, which gave men incentive to exert greater effort. All straw bosses worked, acting as heads of their respective crews. Cost of 1 mile of line, \$130. The reduction in cost of work is 54 per cent. In this instance the ground cover was a little less dense than in the previous examples.

From this is seen that for efficient handling of the crew it is necessary to have at least one straw boss to every 6 or 8 men, with one foreman to 3 straw bosses. Also rest periods on a ratio of 1 to 5 are advisable.

RATION LIST.

Article.	100-ration list.		Rations for 10 days.			
	Imp. crew.	Fire crew.	5 men.	10 men.	20 men.	50 men.
Breadstuffs:						
Baking powder.....	1½ lbs.	1½ lbs.	½ lb....	1½ lbs..	3 lbs....	7½ lbs.
Corn starch.....	2 lbs....	1 lb....	½ lb....	1 lb....	2 lbs....	5 lbs.
Crackers.....	10 lbs....	5 lbs....	3 lbs....	5 lbs....	10 lbs....	25 lbs.
Flour (white).....	80 lbs....	80 lbs....	50 lbs....	100 lbs....	200 lbs....	400 lbs.
Flour (graham).....	20 lbs....	20 lbs....	25 lbs....	50 lbs....	100 lbs....	250 lbs.
Lard.....	10 lbs....	12½ lbs....	5 lbs....	10 lbs....	25 lbs....	60 lbs.
Salt.....	5 lbs....	5 lbs....	3 lbs....	5 lbs....	10 lbs....	25 lbs.
Soda.....	½ lb....	½ lb....	1 lb....	1 lb....	1 lb....	3 lbs.
Yeast cakes.....	2 pkgs....	2 pkgs....	1 pkg....	2 pkgs....	4 pkgs....	8 pkgs.
Beverages:						
Cocoa.....	2 lbs....	1 lb....	½ lb....	1 lb....	2 lbs....	5 lbs.
Coffee.....	10 lbs....	12 lbs....	6 lbs....	12 lbs....	25 lbs....	60 lbs.
Tea.....	1 lb....	1 lb....	1 lb....	1 lb....	2 lbs....	5 lbs.
Milk.....	30 cans	36 cans	18 cans	¾ case	1½ cases	4 cases.
Cereals:						
Corn meal.....	5 lbs....	5 lbs....	5 lbs....	10 lbs....	10 lbs....	25 lbs.
Cream of wheat.....	2 lbs....	2 lbs....	1 lb....	2 lbs....	4 lbs....	10 lbs.
Rice.....	5 lbs....	5 lbs....	2½ lbs....	5 lbs....	10 lbs....	25 lbs.
Rolled oats.....	5 lbs....	5 lbs....	5 lbs....	5 lbs....	10 lbs....	25 lbs.
Tapioca.....		2 lbs....				
Fruits:						
Apricots (dried).....	1 lb....	2 lbs....	1 lb....	2 lbs....	5 lbs....	10 lbs.
Apples (dried).....	3 lbs....	5 lbs....	2½ lbs....	5 lbs....	10 lbs....	25 lbs.
Prunes (dried).....	5 lbs....	10 lbs....	5 lbs....	10 lbs....	20 lbs....	100 lbs.
Raisins.....	2 lbs....	11 lbs....	1 lb....	1 lb....	2 lbs....	5 lbs.
Meats:						
Bacon.....	5 lbs....	20 lbs....	10 lbs....	20 lbs....	40 lbs....	100 lbs.
Beef ¹	100 lbs	75 lbs....	35 lbs....	75 lbs....	150 lbs....	375 lbs.
Ham ¹	20 lbs....	50 lbs....	25 lbs....	50 lbs....	100 lbs....	250 lbs.
Mutton ¹						
Spices and extracts:						
Allspice.....	2 ozs....					
Cinnamon (ground).....	½ lb....					
Cloves.....	4 ozs....	4 ozs....	2 ozs....	4 ozs....	½ lb....	2½ lbs.
Ginger.....	4 ozs....	4 ozs....	2 ozs....	4 ozs....	½ lb....	2½ lbs.
Lemon extract.....	8 ozs....	4 ozs....	2 ozs....	4 ozs....	½ lb....	2½ lbs.
Mustard.....	1 lb....	1 lb....	½ lb....	1 lb....	2 lbs....	5 lbs.
Mapeline.....						
Nutmeg.....	4 ozs....	4 ozs....	2 ozs....	4 ozs....	½ lb....	2½ lbs.
Pepper.....	8 ozs....	8 ozs....	4 ozs....	8 ozs....	1 lb....	2½ lbs.
Pepper, red.....						

¹ Fresh meat should be used where it is obtainable at intervals sufficient to keep in camp. If not used, buy 1 pound of cured meat to 2 pounds of fresh meat. Use bacon 1 meal a day, usually breakfast. 1 ration weighs approximately 8 pounds. Require approximately five 150-pound horse loads per day for 100-man crew.

RATION LIST—Continued.

Article.	100-ration list.		Rations for 10 days.			
	Imp. crew.	Fire crew.	5 men.	10 men.	20 men.	50 men.
Spices and extracts—Continued.						
Sage.....	4 ozs.	4 ozs.	2 ozs.	4 ozs.	½ lb.	2½ lbs.
Vanilla extract.....						
Vegetables:						
Beans (white).....						
Beans (lima).....	15 lbs.	15 lbs.	7½ lbs.	15 lbs.	30 lbs.	75 lbs.
Beans (brown).....						
Beans, can P. & B.....						
Onions.....	15 lbs.	20 lbs.	10 lbs.	20 lbs.	40 lbs.	100 lbs.
Peas (canned).....	12 cans					
Potatoes.....	100 lbs	100 lbs.	50 lbs.	100 lbs.	200 lbs.	500 lbs.
Tomatoes (canned).....	½ case	½ case	6 cans.	½ case	1 case	2½ cases.
Miscellaneous:						
Butter.....	10 lbs.	10 lbs.	5 lbs.	10 lbs.	20 lbs.	50 lbs.
Candles.....	2 lbs.	2 lbs.	1 lb.	2 lbs.	2 lbs.	2 lbs.
Cheese.....	7½ lbs.	7½ lbs.	5 lbs.	7½ lbs.	15 lbs.	40 lbs.
Catsup.....	2 bots.	2 bots.	1 bot.	2 bots.	4 bots.	10 lbs.
Eggs.....	20 doz.	20 doz.	10 doz.	20 doz.	1 case.	2 cases.
Honey.....						
Macaroni.....	2½ lbs.	5 lbs.	2 lbs.	5 lbs.	10 lbs.	25 lbs.
Matches.....	½ cad.	½ cad.	½ cad.	½ cad.	1 cad.	1 cad.
Soap (toilet).....	4 bars.	4 bars.	2 bars.	4 bars.	6 bars.	10 bars.
Soap (laundry).....	3 bars.	3 bars.	1 bar.	2 bars.	4 bars.	10 bars.
Sugar (white).....	35 lbs.	45 lbs.	25 lbs.	50 lbs.	100 lbs.	250 lbs.
Sugar (brown).....	5 lbs.	5 lbs.	2½ lbs.	5 lbs.	10 lbs.	25 lbs.
Vinegar.....	1 qt.	1 qt.	1 pt.	1 qt.	½ gal.	2½ gals.
Extras:						
Chocolate (Hersheys).....	10 lbs.	15 lbs.	10 lbs.	15 lbs.	20 lbs.	40 lbs.
Chocolate (ground).....	1 lb.	1 lb.	½ lb.	1 lb.	2 lbs.	5 lbs.
Cabbage.....	25 lbs.					
Carrots.....	50 lbs.	50 lbs.	25 lbs.	50 lbs.	100 lbs.	200 lbs.
Corn (canned).....	12 cans	12 cans	6 cans.	½ case	1 case	2½ cases.
Corn meal.....	5 lbs.	5 lbs.	10 lbs.	10 lbs.	10 lbs.	30 lbs.
Pickles (sweet and sour).....	½ gal.				1 gal.	2 gals.
Sirup.....						

KITCHEN EQUIPMENT.

Articles.	Quantity.			
	5 men.	10 men.	20 men.	50 men.
Stoves:				
Van Dyke			1	1
Sheet iron		1		
Reflector ¹	1	1		
Z-bar grate (48 inches)				1
Fry pans:				
Medium size	2	1	2	
Largest size		1	2	5
Tea pots:				
4-quart ¹	1			
8-quart ¹		1	1	1
12-quart ¹				1
Coffee pots:				
4-quart ¹				2
8-quart ¹		1		
12-quart ¹			1	
16-quart ¹				2
Boiling pots:				
1-gallon ¹	1	1		
2-gallon ¹		1	1	
4-gallon ¹			1	2
Boilers:				
Wash ¹				1
Double ¹		1	2	
Butcher knife	1	1	2	3
Dipper, tin	1	1	2	3
Basting spoon	1	1	2	4
Dish pans:				
Medium	1	1		2
Large			2	2
Cake turner	1	1	1	1
Drip pan ¹	2 1	3 1	3 1	3 2
Flour sieve ¹		1	1	1
Steel			1	1
Wash basin		1	2	3
Alarm clock	1	1	1	2
Lantern ¹	1	1	2	3
Scythe stone			1	2
12-inch files	2	4	4	6
Axes:				
D. B.		1	1	1
S. B.	1	1	1	1
Claw hammer			1	1
Nails 8-40d	pound	2	5	10
Weight	do	40	125	410
				500

¹ Heavy retinned ware.² For reflector.³ For stove.

MESS EQUIPMENT.

Articles.	Quantity.			
	5 men.	10 men.	20 men.	50 men.
Plates, 10-inch ¹	10	12	25	60
Knives.....	6	12	25	60
Forks, 4-tined	6	12	25	60
Spoons:				
Desert.....	6	12	25	60
Table.....	3	6	8	12
Bowls, soup ¹	6	12	25	60
Cups, tin ¹	7	12	25	60
Pail, water, galvanized iron.....	1	1	2	5
Dish ups:				
4-quart ¹	2			
5-quart ¹		2	5	6
6-quart ¹			2	2
10-quart ¹				4
5-quart, granite.....		2	2	4
Buckets, covered:				
4-quart ¹	1	1		2
6-quart ¹			1	
8-quart ¹				2
4-quart ²	1			
6-quart ²		1		
8-quart ²			1	2
Total weight..... pounds.	25	30	70	155

¹ Retinned ware.² Granite ware.

EXTRAS.

Biscuit cutter.	Nutmeg grater.
Cake griddle.	Potato masher.
Canvas table tops.	Rolling pin.
Carbide lamps.	Salt and pepper shakers.
Colander.	Soup ladle.
Egg beater.	Sirup pitcher.
Meat grinder.	Wash tub.
Meat saws.	

LIST OF FIRE-FIGHTING EQUIPMENT.

FIRE TOOLS AND GENERAL EQUIPMENT.

Article.	Size.	Unit of weight.	Number required.			
			5-man.	10-man.	20-man.	50-man.
Axes, D. B. handled.....	3½ and 4 lbs.	1 5¼ lbs..	4	6	12	20
Ax, handles, extra.....		1½ lbs..	0	0	3	5
Mattocks, or grub hoes.....	3 and 5 lbs.	1 4 lbs..	4	6	12	30
Mattock handles		2 lbs.....	0	6	12	30
Shovels, L. H., without spring.....		5½ lbs..	4	4	10	20
Saws, X-cut, with handles.....	6 feet.....	10 lbs..	1	2	2	4
Hammer, handled for saw- yers.....		4 lbs..	0	1	1	2
Wedges.....		2 lbs.....	0	2	3	4
Peavy.....		8 lbs.....	0	1	2	2
Saw-filing outfit (Atkins).....		1 lb.....	0	1	1	2
Files.....	8 inches.....	4 ozs.....	6	6	12	24
Whetstones, carborundum.....		6 ozs.....	2	2	8	15
Emery wheels.....	6 inches.....	6 lbs.....	0	1	1	2
Water bags.....	2½ gallons.....	1 lb.....	2	5	7	12
Do.....	5 gallons.....	1½ lbs.....	0	1	2	4
Canvas water buckets.....		1½ lbs.....	0	2	5	5
Canteens.....		1½ lbs.....	2	2	3	5
Flag.....	4 by 6 feet.....		0	1	1	1
Pack sacks.....		3 lbs.....	2	2	4	6
Pack frames.....		3 lbs.....	0	1	2	3
Rasp.....		1 lb.....	0	1	1	2
Medicine kit.....			0	1	1	1
Cobbler's outfit.....		5 lbs.....	0	1	1	1
Total weights.....			152.50	292.50	555.50	88

¹ Average.

LIST OF STANDARD, EXPERIMENTAL, AND REJECTED EQUIPMENT.**Standard equipment.**

Axes, 3 pounds to 4 pounds, D. B., western pattern, soft center.
Ax handles, second growth hickory (color stain for handles to be adopted by district office.)

Blankets, saddle, double woolen with pad.

Blankets, bed, "U. S. F. S." 3 pounds, woolen.

Binoculars, standard make (8 diameters).

Communication kits (emergency).

Emergency telephone wire.

Grub hoes, 3 pounds (ratio 4 grub hoes to 1 mattock).

Kitchen equipment, plated tin and pressed steel. (Exception, granite iron for fruit dishes.)

4-tined forks and soup spoons.

Mattock, 4½ pounds (ratio 1 mattock to 4 grub hoes).

Mattock handles (second growth hickory).

Pack frames (Clack).

Peavies, preferred to cant hooks.

Saws, crosscut, 5½ feet narrow blade, standard make, extension handles.

Saddles, pack, Decker pattern with "Humane" tree.

Saddles, riding, regulation stock, not less than 14-inch tree.

Shovels, long handled, stiff blade.

Speeders, power, Mudge-Adams, 4-wheel, 4-horsepower, single-cylinder.

Telephone, wall, for lookouts and ranger stations.

Equipment to be experimented with further:

Emery stones (3 pounds for patrol).

Lookout boards.

Lookout equipment.

Kitchen and mess side pack kit (nesting).

Pumps (all kinds).

Water bags, horse.

Stoves, Van Dyke.

Equipment rejected.

7 by 9 wall tents.

Seitz camp stoves.

Telephone, desk (for lookouts).

Kitchen equipment, aluminum and granite iron ware. (Exception, granite iron for fruit dishes.)

Teaspoons.

LIST OF SPECIAL DISTRICT FIRE FORMS.

- D-1 F 5. Rates of pay.
- D-1 F 1. Contract (men).
- D-1 F 11. Identification card.
- D-1 F 2. Time book.
- D-1 F 3. Time slip.
- D-1 F 4. Tally sheet.
- D-1 F 7. Purchase order and invoice (supplies).
- D-1 F 8. Purchase order and invoice (equipment).
- D-1 F 10. Commissary order blank.
- D-1 F 6. Waybill.
- D-1 F 9. Contract (horses).
- D-1 F 12. Board and lodging contract card.
- D-1 F 13. Lodging ticket.
- D-1 F 14. Meal ticket.
- D-1 F 15. Requisition for men and equipment.

Form D—1, F. 5.

(A supply to be printed poster size for use in employment offices.)
(To be printed in all time books.)

U. S. DEPARTMENT OF AGRICULTURE.
FOREST SERVICE.

The following rates of pay will be paid by the Forest Service for the classes of work listed below. Variations from these standard rates will be allowed only in exceptional cases. Board will be furnished by the Government in addition to these wages. If for any reason it is not feasible to furnish board correspondingly higher rates may be paid:

Laborers.....	25 cents per hour.
Straw bosses.....	30 cents per hour.
Foremen.....	35 to 40 cents per hour.
Timekeepers.....	\$3 per day.
Cooks.....	\$3 to \$4 per day.
Assistant cooks.....	\$2.50 to \$3 per day.
Flunkies.....	\$2.50 per day.
Head packer ¹	\$3 to \$4 per day. ²
Packer.....	\$2.50 to \$3 per day. ²

¹ \$4 rate not paid for handling a train of less than 10 pack animals.

² Saddle horse and equipment furnished by Government.

D-1. F-1.

U. S. DEPARTMENT OF AGRICULTURE.

FOREST SERVICE.

CONTRACT FORM.

1. Standard rate of pay is 25 cents per hour with board, except foremen, straw bosses, cooks, packers, and timekeepers.
2. Time and expenses:

Going to fire: Transportation, where available, and board are furnished. If employee works until his services are no longer needed, or if excuse for quitting before discharge is approved by officer in charge of fire, travel time going to the fire as follows will be allowed: Not to exceed eight hours by railroad, boat, or automobile to point of disembarkment. A reasonable amount of time to be determined by the forest officer in charge of the fire from point of disembarkment to fire. If an employee is discharged for inefficiency, insubordination, or other dishonorable discharge, no time will be allowed while going to or returning from fire. Decision of officer in charge to be final.

At fires: Time actually fire fighting; reasonable time as allowed by foreman in walking from camp to fires and return from fire to camp and for such lunch and rest periods as may be fixed by the foreman.

Returning from fires: If the employee works until no longer needed, travel time, transportation, and board to point where paid off will be allowed as in "Going to fire." Transportation will be allowed to point where hired. If an employee is discharged for inefficiency, insubordination, or other dishonorable discharge, no time, board, or transportation expenses will be allowed while returning from fires.

3. No erasures or alterations will be allowed on time slips. Entries must be made in ink or indelible pencil.
4. Commissary and property charges will be entered on time slips and amounts deducted from total amount due.
5. In case of dispute about time no consideration will be given unless reasonable proof is provided. All disputes about time must be settled with timekeeper or foreman at time of discharge.

I, , having been employed by
the Forest Service, U. S. Department of Agriculture, as a
at the rate of per ^(hour) _(day), having read the foregoing
rules, hereby agree to them and agree to work until no longer needed.

(Sign here.) Name.....

Accident notify.....

Address

Tall, short, medium, fair, dark, gray (check). Age, National-
ity, Point of employment,

Travel time allowed, Date, Card

No. Accepted: Employer.

Travel time and card number entered (date), , 191..

Name, timekeeper at
..... (place)

(To be signed in duplicate, one copy to be kept by person making
the employment. The other to be retained by the employee and
presented by him to the timekeeper on the fire.)

Intoxicating liquors or firearms in camp is sufficient cause for discharge.

Form D-1, F7.

[To be returned by timekeeper to quartermaster or purchasing agent for reference.]

U. S. DEPARTMENT OF AGRICULTURE.
FOREST SERVICE.

PURCHASE ORDER AND INVOICE.

Charge to..... project. National Forest.

(Ordered by) (Date.) (Purchased by) (Date.) (Shipped via) (Date.) R. R.

(Transported by) (Date.) (Purchased from) (Date.)

Food supplies.	Amount on hand. ¹	Amount ordered.	Amount shipped.	Amount received.
Breadstuffs:				
Baking powder.....				
Cornstarch.....				
Crackers.....				
Flour, white.....				
Flour, graham.....				
Lard.....				
Salt.....				
Soda.....				
Yeast cakes.....				
Beverages:				
Cocoa.....				
Coffee.....				
Tea.....				
Milk.....				
Cereals:				
Corn meal.....				
Cream of Wheat.....				
Rice.....				
Rolled oats.....				
Tapioca.....				
Fruits:				
Apricots, dried.....				
Apples, dried.....				
Prunes, dried.....				
Raisins.....				
Meats:				
Bacon.....				
Beef.....				
Ham.....				
Mutton.....				
Spices and extracts:				
Allspice.....				
Cinnamon.....				

¹ In ordering from a quartermaster this column must be filled out.

Food supplies.	Amount on hand.	Amount ordered.	Amount shipped.	Amount received.
Spices and extracts—Continued.				
Cloves.....				
Ginger.....				
Lemon extract.....				
Mustard.....				
Mapleine.....				
Nutmeg.....				
Pepper.....				
Red pepper.....				
Sage.....				
Vanilla.....				
Vegetables:				
Beans, white.....				
Beans, lima.....				
Beans, brown.....				
Beans, P. & B.....				
Onions.....				
Peas (canned).....				
Potatoes.....				
Tomatoes (canned).....				
Miscellaneous:				
Butter.....				
Candles.....				
Cheese.....				
Catsup.....				
Eggs.....				
Honey.....				
Macaroni.....				
Matches.....				
Soap (toilet).....				
Soap (laundry).....				
Sugar, white.....				
Sugar, brown.....				
Vinegar.....				
Extras:				
Chocolate (Hershey's).....				
Chocolate, ground.....				
Cabbage.....				
Carrots.....				
Corn, canned.....				
Corn meal.....				
Pickles, sweet.....				
Pickles, sour.....				
Sirup				

Order filled by (date).

(Signature of merchant or quartermaster.)

Checked by (date).

Received by (date).

Form D-1 F8.

[To be returned by timekeeper to quartermaster.]

**U. S. DEPARTMENT OF AGRICULTURE.
FOREST SERVICE.**

PURCHASE ORDER AND INVOICE FOR EQUIPMENT.

Send to....., National Forest.

Ordered by....., (date)..... Purchased by.....
.....(date). Purchased from.....,(date).

	Amount ordered.	Amount shipped.	Amount received.
<i>Kitchen equipment.</i>			
Alarm clock.....			
Basin, wash.....			
Boiler:			
Wash.....			
Double.....			
Can opener.....			
Cake turner.....			
Coffee pots, tin:			
5-quart.....			
8-quart.....			
20-quart.....			
Dish pans:			
Large.....			
Medium.....			
Dippers, large.....			
Drip pan.....			
Forks, large.....			
Fry pans:			
Medium.....			
Largest.....			
Flour sieve.....			
Grates, 2-bar.....			
Griddle, cake.....			
Kettles, covered:			
Tin, 4-quart.....			
Tin, 6-quart.....			
Tin, 8-quart.....			
Galvanized iron, 16-quart.....			
Galvanized iron, 20-quart.....			
Knives, butcher, 12-inch.....			
Lantern.....			
Reflectors.....			
Saws, meat.....			

	Amount ordered.	Amount shipped.	Amount received.
<i>Kitchen equipment—Continued.</i>			
Sacks:			
Lunch.....			
Cotton, assorted sizes.....			
Scythe stone.....			
Steel, butcher's.....			
Stoves:			
Van Dyke.....			
Sheet-iron.....			
Spoons, large.....			
Toweling, kitchen.....			
Pail, water, galvanized-iron.....			
<i>Mess equipment.</i>			
Bowls, soup.....			
Cups, nested, tin.....			
Knives and forks, tinned; forks 4-tined.....			
Plates, 10-inch, tin.....			
Pudding pans, galvanized-iron:			
4-quart.....			
6-quart.....			
10-quart.....			
Pitchers:			
Sirup.....			
Milk.....			
Spoons, soup, tinned.....			
<i>Camp equipment.</i>			
Axes, S. B.....			
Cobbler's outfit.....			
Communication kit.....			
Drawknife.....			
Hammer, claw.....			
Handsaw, crosscut.....			
Nails:			
Hungarian.....			
8d, wire.....			
40d, wire.....			
Rope, $\frac{3}{8}$ -inch.....			
Tents, 10 by 12.....			
Flies, 14 by 20.....			
<i>Bed equipment.</i>			
Blankets.....			
Shelter tents.....			
<i>Pack equipment.</i>			

(See lists in Fire Manual.)

	Amount ordered.	Amount shipped.	Amount received.
<i>Fire-fighting equipment.</i>			
Axes, D. B:			
Carborundum ax stones, pkt.			
Carborundum grinders			
Files, bastard:			
8-inch			
10-inch			
Grub hoes and handles			
Hammers, 8-pound, D. J			
Handles, saw			
Mattocks and handles			
Peavies			
Rasps, — inch			
Saw set, complete			
Saws, crosscut, standard			
Shovels (standard)			
Wedges (iron)			
Water bags:			
1-gallon			
2-gallon			
5-gallon			
<i>Miscellaneous equipment.</i>			

Checked by.....,(date).

Received by.....,(date).

Form D-1, F10.

U. S. DEPARTMENT OF AGRICULTURE.

FOREST SERVICE.

..... National Forest. Project

COMMISSARY ORDER BLANK.

(Must be signed by employee at the time articles are ordered. Articles ordered must be charged to employee and noted in time book at the time they are received.)

Under no circumstances will cash be accepted for commissary by timekeeper or officer in charge.)

To (Officer in charge.) (Date.)

Please purchase following articles and charge to my account:
Size or kind.

.....	Charges.....	Posted.....
.....	Charges.....	Posted.....
.....	Charges.....	Posted.....

I hereby agree to receive above articles and have same charged to my account.

Ordered No.
(Date.) (Temporary laborer.)

Above articles have been received: No.
(Temporary laborer.)

Amount entered in time book No. against employee's account.
Date.

Timekeeper.

NOTE.—Goods received as per order and not accepted by employee without just reasons, will be charged to employee's account in same manner as if they had been received.

D-1, F6.

U. S. DEPARTMENT OF AGRICULTURE.
FOREST SERVICE.
WAY BILL.

No. 1.

Date: Aug. 10, 1915.

J. Doe, (Consignor.)	at	Missoula, Mont. (Place of origin.)
R. Roe, (Consignee.)	at	Dry Creek Fire. (Destination.)
Via pack train. (Methods of transportation, auto, wagon, pack train.)		

No. of pieces.	Description (boxes, sacks, etc.).	Labels of articles of cargo.
6	Boxes	R. Roe, Dry Creek.
4	Sacks	Do.
2	Stoves	Do.
10	Axes	Do.

Checked by—	Date.	Remarks.
At (origin): J. Doe.....	8/10/15	All in good order.
En route: ¹ Wm. Jones, packer.	8/11/15	1 box broken, 1 stove damaged.
Destination: R. Roe.....	8/12/15	1 box broken, 1 stove damaged, balance shipment O. K.

¹ Packers, teamsters, and others handling goods en route will check and sign here.

SPECIFICATIONS.

(White original, yellow duplicate. Size of time books $3\frac{1}{2}$ by 8 inches. Paper cover. Leaves perforated for removal.)

Form D-1, F9.

(CONTRACT FORM.)

(For Pack Animals.)

**U. S. DEPARTMENT OF AGRICULTURE,
FOREST SERVICE.**

..... National Forest.

- (1) cents per day while in pasture, specified by hiring officer. Rate to start when horses are placed in pasture. Horses will be shod at Forest Service expense. Not less than \$..... per head guaranteed if horses are not used.
- (2) cents per day for horses in service—equipment furnished by Government.
- (3) \$..... per day for horse in service—equipment furnished by owner. Equipment furnished as follows:
-

(Equipment to be listed.)

-
- (4) Liability for all horses killed or injured assumed by owner or his agent and provided the liability for pack horses be limited to \$75 and pack mules to \$125 and in no case to exceed the appraised value. Appraisement to be made before or at the time of contract of hire.
- (5) All expenses relative to the maintenance of horses to be assumed by Forest Service after hiring contract has been signed by Forest officer.
- (6) *Specifications.*—Horses to be broken and in healthy condition. All horses not capable of use or of carrying 150 pounds will be rejected regardless of contract. Equipment furnished must pass the inspection of the hiring officer. Decision of hiring officer to be final in all cases.

(7) *Description of animal:*

Color: Sex: Mare, gelding, mule (use check).
Name: Height .. hands. Weight ... pounds. Age,
.. years. Brands: Defects noticed:
Appraised value of animal: \$ Of equipment \$.....
No. of horse and equipment: ... Point of hire:
Date hired:
To be returned to

(Name of owner.) (Address.)

I hereby agree to the above rules and certify that I have the right to hire to the Forest Service the above described animal and equipment. (Scratch out if not furnished).

(Signed)
(Owner or agent.)

I have received the above-described animal and equipment (scratch if not furnished) this day of 191...
(Date.)

at M.
(Time.)

(Signed)
(Hiring officer.)

Time book No.

(In case of loss or injury to horse this contract is to accompany Form 5a voucher.)

Specifications of contract form to be bound in book, size of new time book, $3\frac{3}{4}$ by 8 inches. Original to be on white paper. Duplicate to be on yellow paper. Books to be bound with carbon leaves attached. Paper covers. Leaves to be perforated for removal.

From D-1, F15.

U. S. DEPARTMENT OF AGRICULTURE.

FOREST SERVICE.

Requisitions for—

Men.....	Date.....
Horses.....	
Supplies.....	
Equipment.....	

For National Forest. Ordered by.....

Time received by.....

Time wanted at.....

To be shipped via..... to.....

Men:

Fire fighters.....	To be shipped via..... to.....; trans. arranged..... (Initial.)
Cooks.....	
Packers.....	
Foremen.....	
Saw filers.....	

Is clothing needed?.....

Horses and saddles:

Pack horses.....	To be shipped via..... to.....; trans. arranged..... (Initial.)
Saddle horses.....	
Pack saddles.....	
Riding saddles.....	

Supplies:

Rations for.....	men.....	days.....
	(Number.)	(Number.)

Equipment:

Tents..... ; flies.....

Water bags, No..... ; size.....

Bedding.....

Tools.....

Utensils—

Mess.....

Kitchen.....

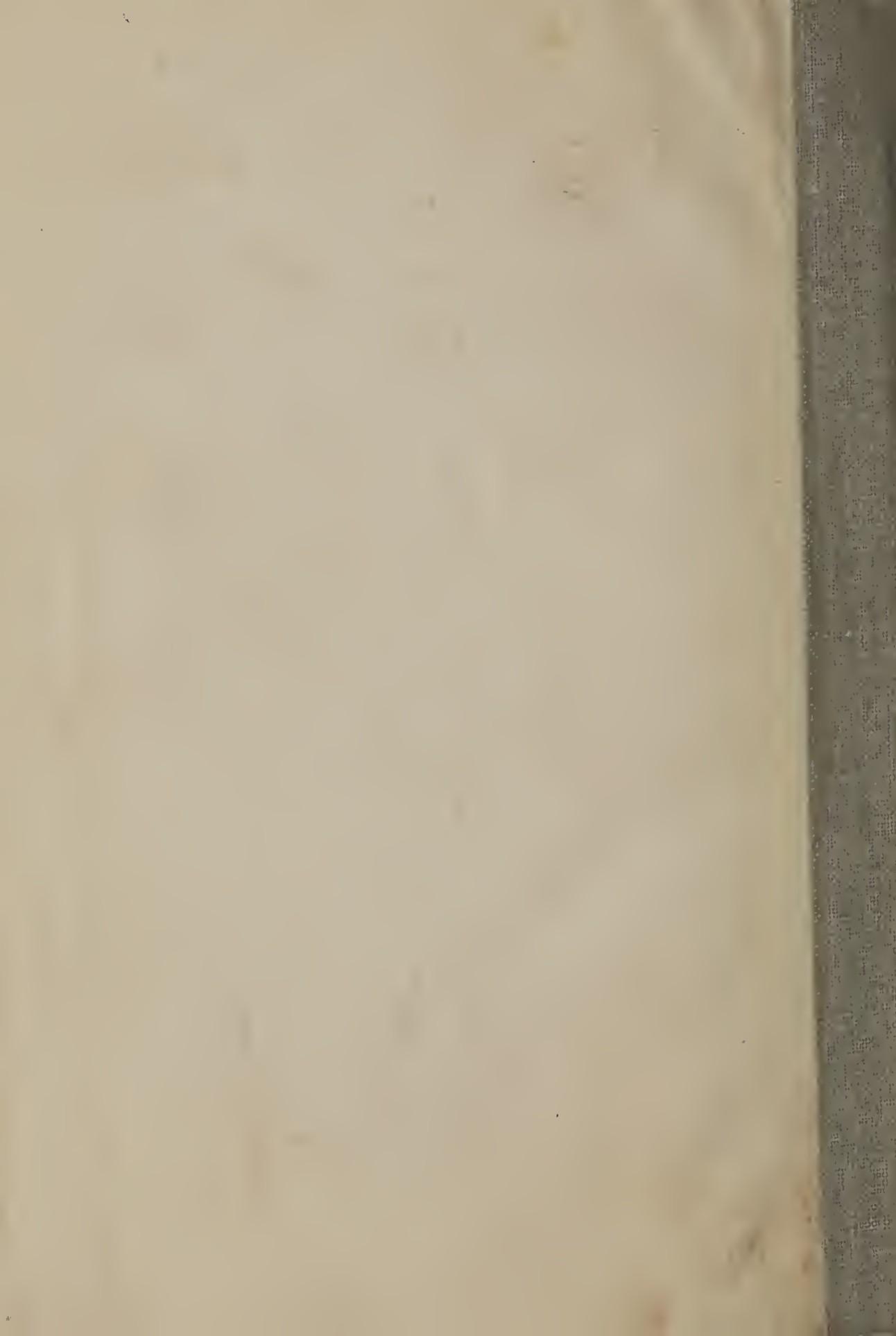
Miscellaneous.....

..... Time received for filling..... (name).

Time filled..... (name).

Shipped via..... hour..... (name).





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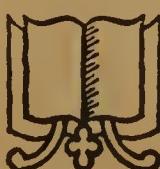
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